Aalto University
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Technology acceptance among public sector nurses in cancer care

Affecting factors and the role of the software provider

Master's Thesis
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ABSTRACT OF
MASTER'S THESIS

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Information technology has become a significant component of modern nursing. Better care results and efficiency gains drive decision makers towards new services both at clinics and in policy-level changes. In practice, nurses sometimes end up not using these services. The potential benefits never materialize, which can then lead to both medical and financial problems.

This thesis identifies factors affecting the behavioral intention to use a new digital service. It expands on existing technology acceptance research by providing a nurse viewpoint in the specific context of public sector cancer care. In addition, it addresses the software provider's role, a topic somewhat lacking in existing research. The unified theory of the acceptance and use of technology (UTAUT) is used as the theoretical framework of the study.

The research is a qualitative case study using action research methodology. Theme interviews were conducted with 2 software provider employees, 1 pharmaceutical company employee and 3 nurses. The findings were utilized to construct two technology training sessions in separate clinics (n = 7, n = 4), in which intervention-level factors were investigated. Combining these, a set of factors affecting behavioral intention was devised.

Six larger themes were found to be enablers: early involvement of (superuser) nurses, superior support and usage, integrations with existing systems, hands-on testing with peers, reducing effect of changes in nurse-patient relationship, and better workload management. Similarly, five hindrances were found: incompatibility with workflow; difficulties in motivating patients to use the service; increased workload; lack of use by colleagues and superiors; and an uncertain, forceful implementation process. Regarding the software provider's role, four findings were outlined: trainings can be beneficial but clinic workflow can block that; nurses should be involved early and kept up-to-date; software features should aim to reduce workload; guidelines based on nurse experiences should be suggested to the clinic management.

Altogether, this study expands existing research with a public sector oncology nurse viewpoint by highlighting the importance of workflow and high-level decisions. Besides, it gives software providers and clinic management tools to increase the likelihood of a successful implementation.

Keywords:	healthcare, technology acceptance, UTAUT, oncology, nursing, behavioral modelling training, training, implementation, action research
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Tietotekniikasta on tullut merkittävä osa nykyaikaista hoitotyötä. Paremmat hoitotulokset sekä tehokkuushyödyt ohjaavat kohti uusia palveluita sekä arkityössä että poliittisissa päätöksissä. Käytännössä hoitajat eivät kuitenkaan aina päädy käyttämään näitä palveluita. Potentiaalisia hyötyjä ei koskaan synny, mikä taas voi johtaa sekä hoidollisiin että taloudellisiin ongelmiin.

Tämä tutkimus nostaa esiin tekijöitä, jotka vaikuttavat uuden digitaalisen palvelun hyväksyntään. Se laajentaa olemassaolevaa tutkimusta perehtymällä julkisen sektorin syöpähoitajien näkökulmaan. Lisäksi tutkimus ottaa kantaa palveluntarjoajan rooliin, josta aiempi tutkimus on vähäistä. Työn teoreettisena kehyksenä toimii yhdistetty teoria teknologian hyväksynnästä (UTAUT).

Työ on toimintatutkimuksena toteutettu kvalitatiivinen tapaustutkimus. Työ alkoi eri tahoille tehdyillä teemahaastatteluilla, joihin osallistui 2 palveluntarjoajan työntekijää, 1 lääkeyrityksen työntekijä ja 3 hoitajaa. Haastattelulöydösten avulla luotiin pohja kahdelle teknologiakoulutukselle (n = 7, n = 4), joiden avulla tutkittiin interventiotason tekijöitä. Kaikista löydöksistä koottiin yhteen teknologian hyväksyntään vaikuttavia ja palveluntarjoajan rooliin liittyviä tekijöitä.

Kuusi laajempaa mahdollistajaa löytyi: (pääkäyttäjä)hoitajien aikainen osallistaminen, johdon tuki ja palvelun käyttö, integraatiot olemassaolevien järjestelmien kanssa, käytännön testaaminen kollegoiden kanssa, hoitaja-potilas-suhteen muutosten vaikutusten vähentäminen, ja parempi työmäärän hallinta. Vastaavasti viisi estettä löytyi: epäsopivuus työtapojen kanssa; vaikeus motivoida potilaita käyttämään palvelua; kasvanut työtaakka; kollegoiden ja johdon käytön puute; ja epävarma, pakotettu käyttöönottoprosessi. Palveluntarjoajan toimiin liittyi neljä löydöstä: koulutukset voivat olla hyödyllisiä, mutta klinikan työtavat voivat kumota hyödyt; hoitajat pitää osallistaa aikaisin ja pitää ajan tasalla; ohjelmiston ominaisuuksien pitää pyrkiä vähentämään työtaakkaa; klinikan johdolle pitää ehdottaa ohjenuoria, jotka pohjautuvat hoitajien kokemuksiin.

Kokonaisuudessaan työ syventää olemassaolevaa tutkimusta julkisen sektorin syöpähoitajan näkökulmalla nostamalla esiin työtapojen ja ylemmän tason päätösten merkityksen. Lisäksi se tarjoaa palveluntarjoajalle ja klinikan johdolle tapoja lisätä onnistuneen käyttöönoton todennäköisyyttä.

Asiasanat:	terveydenhuolto, teknologian hyväksyntä, UTAUT, onkologia, hoitotyö, koulutus, käyttöönotto, toimintatutkimus
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I don't know what the future holds, but I guess there's only one way to find out.

Espoo, May 27th, 2019

Aleksi Taipale

Abbreviations and Acronyms

AR	Action research
BMT	Behavior modeling training
EHR	Electronic health record
EUC	End-user computing
HCP	Healthcare professional
HIS	Health information system
HIT	Health information technology
ICT	Information and communication technology
IT	Information technology
SME	Small-to-medium enterprise
TAM	Technology acceptance model
TPB	Theory of planned behavior
TRA	Theory of reasoned action
UTAUT	Unified theory of acceptance and use of technology

Contents

Chapter 1

Introduction

This chapter outlines the motivation behind this study by looking at the global role of health information technology and experiences about technology implementations, as well as research concerning technology acceptance. The research questions and their background will be presented, and the chapter will be concluded with a summary of the study structure.

1.1 Background and motivation

Health information technology (HIT) is gaining traction around the world. According to a global survey on HIT (World Health Organization 2017, p. 25), 48% of the participating 174 countries currently have a health IT policy in place, many as part of their National Health Program. Policymakers' interest in health IT is not surprising, considering that many studies show health IT being associated with positive clinical outcomes (see for example the meta-analyses by Buntin et al. 2011; Kruse and Beane 2018). David and Jahnke (2004) summarize clinics' interest in health technology in three main motivators: clinical necessity, management support and market preference. The potential of healthcare technology, it seems, is quite an alluring prospect.

However, the actual situation surrounding health IT seems bleaker. New technology relates to a myriad of new problems, from problems with maintenance and compliance with regulations to more down-to-earth ones the technology simply not being used (David and Jahnke 2004). Failure to adopt innovations is common, even when there are demonstrable benefits (Kimberly and Evanisko 1981; Tushman

and Anderson 1986; Henderson and Clark 1990; as cited in Edmondson et al. 2001).

Sometimes failures in HIT implementation are related to more high-level factors such as healthcare policy and reimbursements. Steinberg et al. (2015) highlight how digital healthcare software needs to forge a path that aligns neither with the model used with digital non-healthcare tools nor the one used with non-digital healthcare tools. The linear, slow development process of medical devices does not fit the agile process used in software development. Then again, all health technology needs to be clinically validated, which is a slow, expensive and regulated process — and starkly in contrast with the aforementioned experimental and iterative paradigm of software development. Regulators also have a hard time in finding the right balance for accommodating software solutions (Desveaux et al. 2017). Being aligned with regulations and clinical validation requirements is not only a pre-requisite for getting into the market but also has implications on whether the use of the new technology will be reimbursed to the hospital, which has direct consequences on the prospective cost benefits of the software. Trout et al. (2017) posit that telehealth technologies need to be reimbursable for healthcare providers to more widely adopt and use them. Related to this, they note that in the United States, no "widely accepted telehealth reimbursement policies" exist across states. Considering the global variety in HIT policies (World Health Organization 2017), it seems unlikely that Europe would fare much better in such an analysis. Finland, though, has (on certain conditions) reimbursed telehealth services since 2016 (Kansaneläkelaitos 2016) and hence probably is not as affected by reimbursement-related issues.

As noted above, high-level decisions have significant effects on technology adoption. Sometimes, however, implementation failures happen on the work floor. The technology used might just not be up to par, being "neither interoperable nor easy to use" (Kellermann and Jones 2013). Perhaps the technology is not compatible with the "work process, tasks or practice" (Gagnon et al. 2012) at the clinic. While this might seem like a problem with the technology, it also highlights the fact that implementations are complex sociotechnical processes, where technology needs to be successfully implemented into a social context. What follows is that, as described by Gagnon et al., social factors such as human and organizational environments

also come to play an important role in the adoption of new technologies. For the technology provider this means that technology needs to be made in a way that adapts to the environment in question. Then again, workflow challenges create implications for the healthcare provider: reaping the full benefits of health IT requires re-engineering the care processes as well, as outlined by Kellermann and Jones (2013). However, routines are hard to change (McGrath et al. 1984; Gersick and Hackman 1990; as cited in Edmondson et al. 2001) and have usually developed "around the use of existing technologies" (Orlikowski 2000; as cited in Edmondson et al.), making implementation a difficult task for all parties involved.

All in all, failed implementations bring about a multitude of problems. Considering the positive outcomes associated with health IT, one worry relates to the effect on healthcare. If patient health can be improved by better software or better usage of existing digital tools, it would seem that there is a very clear high-level motivator for clinics and policymakers to leverage health IT. On the other hand the software providers making the health IT solutions, private and public alike, also have a business interest in the software being used. Knowing the enablers and hindrances behind successful technology implementations might help to alleviate problems and reduce the chance of a failed implementation.

The interest in technology acceptance has been researched now for over two decades (Venkatesh et al. 2007). Over the years, it has been formalized into different acceptance models, starting with the 1989 *Technology Acceptance Model* (TAM) by Davis. TAM led the way in more structured frameworks being utilized to understand technology acceptance. It has received updates in the form of TAM2 (Venkatesh and Davis 2000) and TAM3 (Venkatesh and Bala 2008). In addition, other similar models have been developed, such as the *Unified theory of acceptance and use of technology* UTAUT (Venkatesh 1999). In general, these models approach acceptance from the individual's point of view. To give an example from the UTAUT model, this means that factors such as "performance expectancy" and "social influence" are looked at. A further description of different technology acceptance models is given in Section 2.2.1. While technology models have been utilized in the healthcare context (e.g. Holden and Karsh 2010), they have not been designed with healthcare primarily in mind. Thus, looking at healthcare technology

acceptance through the lens of these models is an interesting angle from a research viewpoint.

An overarching thread in technology acceptance models is the importance of "behavioral intention", as worded by Venkatesh et al. (2003) in the UTAUT model. While the exact construct varies from model to model, on a higher level this can be seen as the motivation making the user actually use the software. Its practical implications can be dire: if users do not want to use the software, they most likely will not. This changes a bit depending on whether use is voluntary or forced (Zhou 2008), but the general idea holds. This study aims to shed light on the root causes behind behavioral intention in the public health oncology context, widening the scientific understanding of the subject. Moreover, it tries to open up the nurse perspective regarding the software provider's role in the implementation process.

1.2 Research questions and scope

The aim of this study is to increase understanding about the factors affecting software implementation in the context of public sector oncology. Specifically, the behavioral intention of nurses to use a digital service is considered as an important perspective, and will be the focus of the study. The enablers and hindrances regarding nurses' behavioral intention to use a digital service are looked at. In addition, the study looks at the role of the software provider in supporting the acceptance of a new software. The aim of the thesis has been formulated into three distinct research questions:

RQ1: What factors enable the behavioral intention of nurses towards a digital service in cancer care?

RQ2: What factors hinder the behavioral intention of nurses towards a digital service in cancer care?

RQ3: How can the software provider support the acceptance of a digital service in cancer care?

If nurses do not use the digital service that has been implemented the benefits of the service will never materialize. Especially in contexts where service usage is not mandatory, lack of motivation can lead to the service usage being low or even non-existent. In the UTAUT model that is used in this study, "behavioral intention" is used to describe the motivation. Due to its prominence as a factor in several acceptance models (as seen in Section 2.2.1), investigating behavioral intention is justified. Behavioral intention itself, however, is affected by many factors. These factors as such can relate to almost anything, from usability issues to social context and beyond. Unexpected factors may emerge from the data, and as such no pre-determined scope was given to the potential factors. Indeed, RQ1 and RQ2 aim to identify any factors that could enable or hinder the behavioral intention of oncology nurses towards a digital service in cancer care.

RQ3 aims to investigate the software provider's role in the implementation process, providing a new angle to existing technology acceptance research. The factors found in RQ1 and RQ2 are reflected upon from the viewpoint of the software provider. The research question is concerned with the actions the software provider has taken that have affected the implementation, and the actions they possibly could or even should take to make acceptance more likely.

1.3 Structure of the study

In this section, an overview of the study structure is given. The study is divided into 5 distinct chapters.

Chapter 1 presents the background and motivation behind the study and outlines the research questions and scope of the study.

Chapter 2 gives an overview of the relevant concepts in literature by looking at HIT and technology adoption in general, and then delving into the factors affecting it and the role of training in implementation. This forms the basis for the empirical research.

Chapter 3 goes through the methodology used in the empirical research. First, the more high-level philosophical approach is described, after which the data collection and analysis methods are thoroughly presented.

Chapter 4 shows the results of the empirical research. First, results from each phase of the research are illustrated. Then, the results are summarized as factors enabling and hindering nurses' behavioral intention, categorized by larger themes.

Chapter 5 begins with answers to each of the posed research questions. Enablers (RQ1), hindrances (RQ2) and software provider actions (RQ3) are described, respectively. The theoretical and practical implications of these findings are then discussed. This is followed by an evaluation of the thesis and its limitations. To conclude, a summary of the findings and suggestions for future research are given.

Chapter 2

Background

This chapter forms the basis of this research. First, an overview is given on digital technology in hospitals and the history concerning the topic. After that, the theoretical framework is delved into by describing technology acceptance models in general, followed by a description of the chosen framework, UTAUT. After the theoretical framework, different factors affecting health information technology acceptance are presented, categorized according to the UTAUT constructs. To conclude, technology trainings in general are described because of their use in the methodology of this study.

2.1 Digital technology in hospitals

As described by Kruse and Beane (2018), *health information technology* (HIT) is a loosely-defined umbrella term referring to "a wide range of technologies that store, share, and analyze health information". While this definition focuses on the tools used, some definitions such as the one by Holden and Karsh (2010) also include the related knowledge and skills. Another term to describe digital technologies in health-related contexts is *e-health*. It is also loosely defined, but perhaps puts more emphasis on the networked nature of these digital solutions, as seen in the definition by Eysenbach (2001). In this thesis, the term health IT / HIT shall be used, according to the definition by Kruse and Beane (2018). It is more constrained than the definition by Holden and Karsh (2010), but does not have the kind of emphasis on the network aspect posited by the e-health definition of Eysenbach (2001). Nevertheless, the definition is still relatively forgiving. What follows from

such a broad definition is that the spectrum of different HIT solutions is wide. Indeed, as outlined by Chaudhry et al. (2006) there are a plethora of different HIT solution types for multiple purposes, e.g. clinical documentation, decision support and order entry management.

In general, the usage of HIT has been gaining traction in the recent years, and in many countries it is used in hospitals at least to some extent (Jha et al. 2008). Existing research supports the shift towards digital solutions, and HIT solutions have led to "predominantly positive" outcomes (Buntin et al. 2011; Kruse and Beane 2018). Despite these findings, usage of health IT is low (Kruse and Beane 2018) and experiences of HIT among clinical staff are varied (Ward et al. 2008). The topic of technology acceptance is further addressed in Section 2.2.

While health information technologies are used in hospitals to process medical information, they never exist in isolation, but as a part of a *health information system* (HIS). To understand what a health information system is we should look into the definition of *hospital information system*, which is one instance of a HIS (Haux 2006). As defined by Haux et al. (2004), a hospital information system is a "sociotechnical subsystem of a hospital, which comprises all information processing as well as the associated human or technical actors in their respective information processing roles". They go on to emphasize that it follows that each hospital by definition has some sort of a hospital information system. Health information systems, then, are similar, but in any environment. Put simply, a hospital information system is a health information system in a hospital context. It should be noted, however, that neither definition in itself specifies whether information technology is used or not — an archive of paper records is a HIS as well. Even so, hospital information systems have been the first form of health information systems and as such, historical overviews of HIS progression will inevitably align with the development of hospital information systems.

As outlined by Reichertz (2006), hospital information systems that utilize IT have begun to take shape already in the 1960s. Haux (2006) divides the development in seven distinct "lines", giving a brief but comprehensive overview of the history of their history. It should be noted that these lines are not necessarily sequential,

and as such some have developed alongside each other. The advent, *the 1st line*, is the shift "from paper-based processing and storage to computer-based processing and storage". It brought along more technological complexity but also advances in functionality as well as possibilities with patient data and medical knowledge. At this point the usage was still focused in small, local and specialized applications. *The 2nd line* came about between the 1970–1990s when local system architectures turned global, and the lens was widened from specialized groups to having information systems spanning the whole hospital. Still, factors such as "ease of use -- regarding data input and data usability" left something to be desired, even though the technology being a necessity was already accepted by health care professionals (HCP). *The 3rd line*, Haux continues, was signified by the pool of users expanding — from physicians and administrative staff to nurses and from there on to patients and consumers. While at this point the focus was still on better patient care, in *the 4th line* it was noted that all the amassed data should be utilized in clinical research as well. In the 1990s it was realized that IT systems are connected to a multitude of organizational and strategic problems that should be dealt with. "Strategic, long-term information management" became important, thus signaling the start of *the 5th line*. The development of technology significantly increased the potential data sources available with things such as DNA or protein data becoming more common and the *6th line*, Haux says, was concerned with "the inclusion of new types of data". Finally, *the 7th line* relates to the fact that the range of technologies and their functionalities is ever-increasing. It affects how, when and where data is gathered, creating "new possibilities of organizing care and treatment in a way that might be more convenient for our daily life and may support us to keep living in our social environments".

2.2 Theoretical framework

This section describes the selected theoretical framework, the UTAUT technology acceptance model. First, a brief overview is given on technology acceptance and different acceptance models, after which the selected framework of UTAUT is described.

Terms such as *technology adoption*, *technology acceptance* and *technology diffusion* are often used to describe an IT solution's role in a larger system. While adoption is the most commonly used, these three terms are often used interchangeably (Williams et al. 2009). Ward (2013) posits time as the distinguishing factor between adoption and acceptance: adoption can be defined as "first use, whether through personal choice or imposition" and acceptance as "use becoming a part of normal practice". In Ward's definition diffusion seems categorically different, referring to the "processes [that] are shared between individuals and organizations more widely". Because of the clear distinction between the three terms and Ward's focus on healthcare, these definitions for adoption, acceptance and diffusion will be used throughout the thesis whenever possible. However, since existing research often does not distinguish between the terms, technology acceptance will be the default term throughout the thesis, considering its focus on technology acceptance models (as further described in Section 2.2.1).

2.2.1 Technology acceptance models

The factors related to the acceptance of technology have been formalized in what are called *technology acceptance models*. A more comprehensive review of different models can be found in the literature review by Venkatesh et al. (2003) in their original UTAUT article. However, a brief overview of a few of the more notable different models will be given here as well as a deeper look into UTAUT, which is the model utilized in this thesis.

The roots of technology acceptance models lie in behavioral science research. According to Heckhausen and Heckhausen (1991, p. 10), the moment psychology turned into a more experimental science, questions of motivation started to arise in a more formal context. At this point they were still centered on volition ("decision making, choice behavior"). The 1930s, Heckhausen and Heckhausen continue, widened the scope to include needs and tendencies as determinants of behavior. While this can be seen as the groundwork that technology acceptance research is built on, one of the first links to current technology acceptance research is the

theory of reasoned action (TRA; originally by Fishbein and Ajzen 1977).

The theory of reasoned action (Fishbein and Ajzen 1977) is described by Venkatesh et al. (2003) as "one of the most fundamental and influential theories of human behavior". As outlined by Mathieson (1991), it has served as the basis for later theories such as the technology acceptance model (TAM) and the *theory of planned behavior* (TPB). The essence of TRA, as summarized by Montano and Kasprzyk (2015), is that "the attitude toward a behavior (for example, attitude toward mammography) is a much better predictor of that behavior (obtaining mammography) than attitude toward the object (cancer) at which the behavior is directed". This was in contrast with the prevailing idea at the time, in which the attitude towards the object itself would predict the behavior. In TRA the attitude toward the behavior is the central focus, and it also forms the first core construct of the theory. The second core construct of TRA is subjective norm. By subjective norm, Fishbein and Ajzen (1977, as cited in Venkatesh et al. 2003) refer to "the person's perception that most people who are important to him think he should or should not perform the behavior in question".

The theory of planned behavior (TBP) was created in 1985 by one of the original authors of TRA, Icek Ajzen. TRA, he summed, "applies to behaviors that are under volitional control". Because many behaviors are influenced by factors "over which at least some people have only limited control", TBP's goal was to expand the central tenets of TRA to also apply to these kinds of situations. For this the construct of perceived behavioral control was added besides attitude toward behavior and subjective norm as predictors of the actual behavior. Perceived behavioral control refers to a person's belief that "they have the means and opportunities to [perform the behavior]" (Ajzen 2005, p. 118). These factors, as listed in the original article by Ajzen (1985), could be for example "requisite information, skills, and abilities, including possession of a workable plan, willpower, presence of mind, time, opportunity, and so forth".

The technology acceptance model (TAM; Davis 1989) also stems from TRA, but takes a different path than TPB. In TAM, two determinants for user acceptance are proposed as predictors of system use: perceived usefulness and perceived ease

of use. Davis describes them as follows: perceived usefulness is "the degree to which a person believes that using a particular system would enhance his or her job performance". Perceived ease of use, "in contrast, refers to 'the degree to which a person believes that using a particular system would be free of effort". Mathieson (1991) identifies three differences between TAM and TPB — (1) the degree of generality, (2) the role of social variables and (3) different treatment of behavioral control. TAM, Mathieson continues, posits itself as more generalizable than the very context-dependent TBP. Mathieson summarizes that TAM does not explicitly include social variables because it asserts that they are implicitly included in the outcomes, to some extent. Moreover, in TAM only the person's skills to use the system (ease of use) are analyzed, whereas TPB has a wider view of the means and opportunities related to system usage.

All in all, TAM has been "widely applied to a diverse set of technologies and users" (Venkatesh et al. 2003) and as such, is an important milestone in technology acceptance research. As a point of interest regarding this study, Holden and Karsh (2010) also highlight that TAM has been increasingly used in the healthcare context. While they do note some room for improvement, they feel that TAM's increasing prevalence in healthcare research is justified.

2.2.2 Unified theory of acceptance and use of technology (UTAUT)

The unified theory of acceptance (UTAUT; Venkatesh et al. 2003) is, as its name implies, a theory striving to unify the prior models for technology acceptance. Venkatesh et al. noted that researchers often had to either combine constructs from multiple models or choose one model and "largely ignore the contributions form alternative models". To respond to this Venkatesh et al. evaluated eight existing models, compared them empirically and based on those findings developed the UTAUT model, which they then validated.

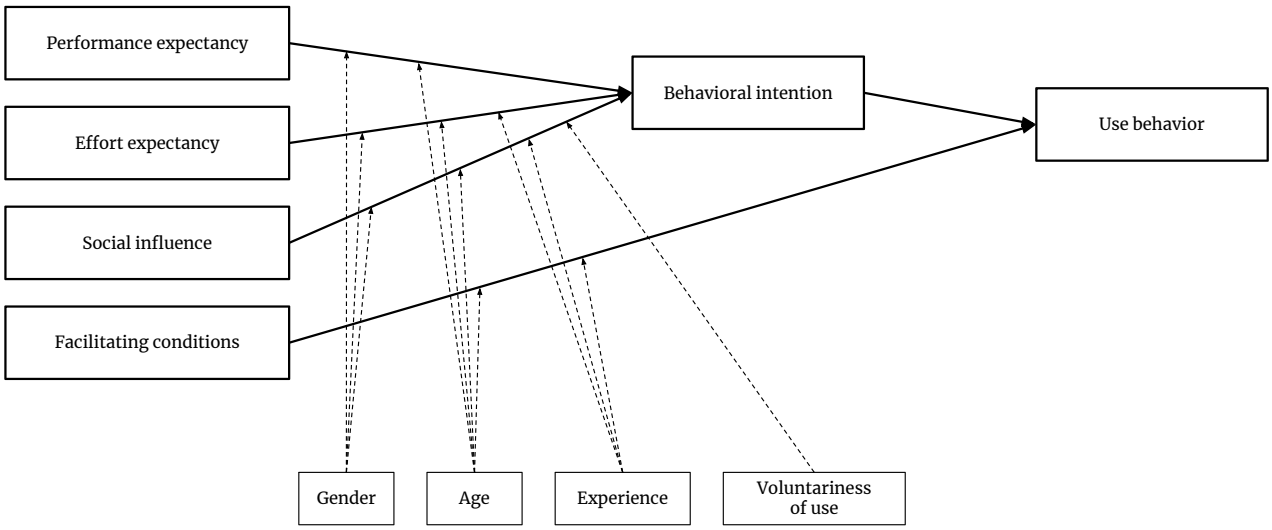

Figure 2.1: The unified theory of the acceptance and use of technology (UTAUT), as adapted from Venkatesh et al. (2003)

In UTAUT (Figure 2.1), behavioral intention is a determinant of use behavior. This view is consistent with many of the other theories, such as TAM. According to UTAUT, the effect to behavioral intention is directly determined by 3 factors: performance expectancy, effort expectancy and social influence. In addition, UTAUT considers facilitating conditions as a direct determinant of usage itself, not behavioral intention. Moreover, in UTAUT these direct determinants are mediated by 4 key moderators: gender, age, experience and voluntariness of use. Performance expectancy refers to "the degree to which an individual believes that using the system will help him or her to attain gains in job performance". Performance expectancy was mediated by gender and age, as the effect was found stronger for men and younger workers. Effort expectancy is defined as the "degree of ease associated with the use of the system". Its effect is mediated by gender, age and experience — women, older workers and those with limited experience are more affected by this. Social influence is described as "the degree to which an individual perceives that important others believe he or she should use the system". All the four moderators affect this: the effect is "stronger for women, older workers, under conditions of

mandatory use, and with limited experience". Finally, "facilitating conditions are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system". Their effects on usage are moderated by age and experience — the "effect [is] stronger for older workers with increasing experience".

As outlined by Williams et al. (2015), UTAUT has been widely used in technology acceptance research since its introduction. In their analysis, they found out that it has primarily been used "in the areas of e-government, e-banking, e-learning and e-commerce". Nevertheless, UTAUT has also been applied in the field of healthcare technology (see f.ex. Ifinedo 2012; Ami-Narh and Williams 2012; Wills et al. 2008; Kohnke et al. 2014; Maillet et al. 2015), but not necessarily as widely as TAM. One reason for there not being more healthcare research might be how recent the theory is: Williams et al. (2015) say that "UTAUT research is still in its relatively early stages of development, but appears to be developing quickly". The use of the model is not necessarily very consistent, with some studies using it as a rigid way to conduct their research and others only using it parts of it. Moreover, Taiwo and Downe (2013) and Williams et al. (2015) have questioned some of the constructs' explaining power altogether.

Nevertheless, UTAUT is a widely used model in technology acceptance research (Williams et al. 2015) with more predictive power than the models it was based on (Venkatesh et al. 2003). It acknowledges the role of non-technology-related factors (e.g. social influence) better than TAM, but at the same time incorporates findings from other technology acceptance theories better than, for example, the theory of planned behavior (TPB). As such, it has been chosen for this study. However, it should be noted that this study does not try to validate the UTAUT model, nor does it utilize its constructs very rigidly. The methodology is partially built upon the findings of UTAUT in how it is constructed, for example by aiming to affect perceived ease of use by using technology training. In addition to this, UTAUT is used when reflecting upon the findings of this study.

2.3 Factors affecting acceptance of healthcare information technology

In this section, the factors affecting the acceptance of healthcare information technology will be described. These factors have been collected from 8 review articles gathering information about HIT acceptance from different viewpoints (McGinn et al. 2011; Gagnon et al. 2012; Huryk 2010; Cresswell and Sheikh 2013; Brewster et al. 2014; Ward et al. 2008; Berg 2001; Peute et al. 2010). They have then been categorized according to the constructs of UTAUT. However, some of the factors did not fit under these categories and as such have been put in separate categories. Whether a factor was considered as an enabler or hindrance depended on the study. For example, Gagnon et al. (2012) note that trainings could be considered as both positive and negative, with the latter referring to insufficient training. Hence, some of the factors might here be described exclusively as an enabler or a hindrance, but in a way can function as both.

It should also be noted that while the UTAUT model and its constructs were already described in Section 2.2.2, this section differs from that in a few ways. Firstly, the concepts in UTAUT are on a relatively abstract level, whereas this section will highlight more specific factors. Secondly, UTAUT has been done from a more general viewpoint, while these studies pertain to the healthcare context.

2.3.1 Enablers

The factors that were seen as enablers are described in this section. A general direction of the analyzed review articles seems to be that there were far more hindrances highlighted than enablers. This can be attributed to the fact that some of the articles explicitly looked into hindrances, instead of factors in general.

2.3.1.1 UTAUT: Effort expectancy

Table 2.1: Enablers related to effort expectancy

Enabler	**Sources**
System being easy to use	McGinn et al. 2011; Gagnon et al. 2012; Huryk 2010; Cresswell and Sheikh 2013; Brewster et al. 2014
Training	McGinn et al. 2011; Gagnon et al. 2012; Kruse et al. 2016; Ward et al. 2008; Brewster et al. 2014
Decreased workload	Ward et al. 2008
Flexible and responsive work practices	Brewster et al. 2014

The factors related to effort expectancy are outlined in Table 2.1. The system being easy to use was unsurprisingly the most common one. When analyzing *electronic health record* (EHR) acceptance, McGinn et al. (2011) found that when systems "were reported as user-friendly, participants tended to perceive EHRs as easy to use and a valuable tool to facilitate work processes". On the other hand, this ease of use could be also facilitated using trainings. Gagnon et al. (2012) found it the most cited internal environment -related factor in their review, saying that "[s]uccessful ICT [information and communication technology] implementation generally included adequate user training and support". Besides, the environment being flexible and having responsive work practices was found by Brewster et al. (2014) to facilitate staff acceptance. Sometimes the systems were also found to decrease the workload of the HCPs (Ward et al. 2008).

2.3.1.2 UTAUT: Performance expectancy

Table 2.2: Enablers related to performance expectancy

Enabler	**Sources**
Better workplace efficiency	McGinn et al. 2011
Enhanced patient safety	Huryk 2010
Early demonstrable benefits	Cresswell and Sheikh 2013
Maintaining quality of staff-patient -interactions	Brewster et al. 2014
Personalization and patient feedback	Brewster et al. 2014

The factors related to performance expectancy are outlined in Table 2.2. These factors pertain to how HCPs can do their job better. McGinn et al. (2011) point out that better workplace efficiency in general was enabled by the system, but also that productivity may increase "due to better access and organization of patient care information". Demonstrating what these benefits are early in the implementation process also works as an enabler, Cresswell and Sheikh (2013) found out. On the other hand, the relationship with the patient forms a large part of the HCPs' job and hence is reflected in their views of performance expectancy. Citing Mair et al. (2008), Brewster et al. (2014) note that face-to-face contact with patients is related to nurses' satisfaction. Therefore, it is important for the system to "maintain the quality of staff-patient interactions". From another patient-related viewpoint, the "perception of enhanced patient care or safety" leads towards a positive attitude.

2.3.1.3 UTAUT: Facilitating conditions

Table 2.3: Enablers related to facilitating conditions

Enabler	**Sources**
Human resources regarding IT support	McGinn et al. 2011; Gagnon et al. 2012
Practice size	McGinn et al. 2011

A few factors related to facilitating conditions were found, as seen in Table 2.3. Thakkar and Davis (2006) found that larger hospitals gain less efficiency benefits from the system than small ones, but need to invest less into relevant hardware because they already have some in place. Besides, in larger hospitals the lack of physician participation was seen as more of a problem than in smaller ones. In addition, as outlined by McGinn et al. (2011), "[i]n studies where adequate technological support and training was provided, these factors tended to be perceived as facilitators".

2.3.1.4 UTAUT: Social influence

Table 2.4: Enablers related to social influence

Enabler	**Sources**
Bottom-up approach to implementation	McGinn et al. 2011; Gagnon et al. 2012; Berg 2001
Management	McGinn et al. 2011; Gagnon et al. 2012; Berg 2001
Superusers / "internal champions"	Gagnon et al. 2012; Cresswell and Sheikh 2013; Brewster et al. 2014
Relationship between administration and HCPs	McGinn et al. 2011; Gagnon et al. 2012
Collaboration between medical professionals	Brewster et al. 2014
Patients' attitudes	Gagnon et al. 2012
Support and promotion of system by colleagues	McGinn et al. 2011

The factors related to social influence are described in Table 2.4. The role of management was emphasized in many articles. Reflexive management approaches as well as prioritization by the management team were pointed out by McGinn et al. (2011). Berg (2001) describes how "[an implementation] process can only get of [sic] the ground when properly supported by both central management and future users". Moreover, Berg highlights, "a top down vision and framework for the implementation is crucial". On the other hand, they do note that the professionals "cannot be simply told to change their work patterns by senior management". In line with this, a bottom-up approach to implementation was noted to be an enabler in successful implementations. Actively involving users during the implementation increases psychological ownership of the system and consequently also the perceived ease of use and perceived usefulness (Gagnon et al. 2012). An oft-mentioned way to approach this was to have "superusers" or "internal champions". Gagnon et al. assert that these superusers could test the system and take an expert role during the system's introduction. Cresswell and Sheikh (2013) describe their role as being "boundary spanners" who connect IT staff, management and clinicians

together. In general the relationship between administration and HCPs was seen as an enabler.

The direct social sphere around the HCPs' daily work also affected the implementation success. The attitudes of patients were also sometimes cited as a positive influence (Gagnon et al. 2012). Moreover, the system being promoted and supported by colleagues was found to be an enabler by McGinn et al. (2011). Related to this, "increased collaboration between medical professionals within newly created multidisciplinary teams formed to deliver telehealth was also seen as a positive outcome" (Brewster et al. 2014).

2.3.1.5 Other: Organizational

Table 2.5: Enablers related to organizational aspects

Enabler	**Sources**
Researching organization with interviews etc.	Berg 2001; Peute et al. 2010
Change in tasks	McGinn et al. 2011
Choice of system	McGinn et al. 2011
Continuous evaluation of real-life usage	Berg 2001
Having a feedback process	Peute et al. 2010
Organizational readiness	Peute et al. 2010
Project is able to react to changes during process	Peute et al. 2010
Risk and safety assessment	Brewster et al. 2014

As seen in Table 2.5, many enablers were related to organizational aspects and as such did not fit within the UTAUT constructs very well. Researching the target organization before and during the implementation was highlighted as a way to increase the likelihood of a successful implementation. Berg (2001) mentions how getting specifications directly from the users is hard, but that studying the

"social organization of actual working practices" using ethnographic methods, in-depth interviews and observation "can be highly useful". Similarly, Peute et al. (2010) underline the importance of prior research for system usability and project communication. Even so, Peute et al. also note that the implementation project should have mechanisms to react to the project inevitably changing during the process. According to them, there should be a clear feedback process to ensure user participation throughout. Moreover, the real-life usage should be continuously evaluated, though this evaluation does not need to be "costly or highly formalized", says Berg (2001). "The trick", Berg continues, "is to focus on just a few important parameters, and to observe and interview the few core processes and stakeholders that are key". At the same time, they do acknowledge that this is not easy.

An "appropriate risk and safety assessment" early in the implementation process would alleviate patient safety concerns (Brewster et al. 2014). Going even further back in the implementation process, already a good selection of the used software can enable a successful implementation (McGinn et al. 2011). Besides, the organization needs to be ready to take the system into use (Peute et al. 2010), as well as change tasks to help this process (McGinn et al. 2011).

2.3.2 Hindrances

The factors that were seen as hindrances are described in this section.

2.3.2.1 UTAUT: Effort expectancy

Table 2.6: Hindrances related to effort expectancy

Hindrance	**Sources**
Lack of time and workload	McGinn et al. 2011; Gagnon et al. 2012; Kruse et al. 2016; Huryk 2010; Ward et al. 2008; Cresswell and Sheikh 2013; Brewster et al. 2014
Lack of familiarity with IT in general	Gagnon et al. 2012; Ward et al. 2008; Brewster et al. 2014
Lack of ability to test system	McGinn et al. 2011; Berg 2001; Cresswell and Sheikh 2013
Familiarity and ability with system	McGinn et al. 2011
Resistance to changing work habits	Kruse et al. 2016
System being difficult to use	McGinn et al. 2011
Upgrades	Kruse et al. 2016

Many hindrances were related to the effort expectancy of the system, as shown in Table 2.6. An overarching theme was the lack of time and increased workload, seen both in fears before actually using as well as in actual use experiences. In the review by Ward et al. (2008), some studies found that physicians at the same time saw potential in the systems, but also feared that the system could increase their workload. Huryk (2010) similarly points out that if time savings were expected but not realized, it caused negative reactions. Then again, Huryk highlights a scenario where the workload was increased, but the nurses felt that it was warranted because of the increase in patient safety caused by the system.

The lack of familiarity and ability with the system was mentioned as a hindrance (McGinn et al. 2011). The reasons that might cause this were many. Perhaps the system just was difficult to use, as highlighted by McGinn et al. It is also possible that the users have not been given enough (if any) opportunities to test the system. Cresswell and Sheikh (2013) claim that users should already be able to

test early prototypes, while McGinn et al. (2011) posit "trialability" as a hindrance. Sometimes the problem might not be in the user's familiarity with the system, but with IT in general. According to Gagnon et al. (2012), it "affected time efficiency and -- was also related to training issues". Then again, sometimes the systems just are difficult to use, which hinders their use (McGinn et al. 2011). And even if the system had been learned, upgrades can sometimes disrupt standard operations (Kruse et al. 2016). Sometimes, however, simply a resistance to changing work habits might hinder the acceptance of a system, Kruse et al. note.

2.3.2.2 UTAUT: Performance expectancy

Table 2.7: Hindrances related to performance expectancy

Hindrance	**Sources**
Design or technical concerns	McGinn et al. 2011; Gagnon et al. 2012; Kruse et al. 2016; Huryk 2010; Ward et al. 2008; Brewster et al. 2014
Mismatch between system and workflow	Gagnon et al. 2012; Berg 2001; Kruse et al. 2016; Peute et al. 2010; Cresswell and Sheikh 2013
Less face-to-face contact with patient	McGinn et al. 2011; Gagnon et al. 2012; Huryk 2010; Brewster et al. 2014
Less autonomy over own work	Berg 2001; Cresswell and Sheikh 2013; Brewster et al. 2014
Evidence regarding the benefits of the system	McGinn et al. 2011; Gagnon et al. 2012
Loss of clinical productivity	McGinn et al. 2011; Kruse et al. 2016
Perceived usefulness	Kruse et al. 2016; Brewster et al. 2014
Scientific quality of system resources	McGinn et al. 2011; Gagnon et al. 2012
Inability to easily input historic medical record data	Kruse et al. 2016
Installation issues	Brewster et al. 2014
Medical errors	Kruse et al. 2016
Missing data	Kruse et al. 2016
Patient safety concerns	Brewster et al. 2014
Reliability concerns	Brewster et al. 2014

The hindrances related to performance expectancy are displayed in Table 2.7. A prominent theme was the relatively broad "design or technical concerns". If nurses needed to be fixing technical problems with the system, they felt that they could not give enough attention to patient needs (Brewster et al. 2014). Similarly, content design and the customizability of the system were related to this (Ward 2013). In the same vein, the importance of the system resources being scientifically

credible was underlined (McGinn et al. 2011; Gagnon et al. 2012). Missing data, medical errors, patient safety concerns and reliability concerns were also seen as hindrances for HCPs being able to perform their job as best as they can (Kruse et al. 2016; Brewster et al. 2014). Similarly, nurses regarded face-to-face contacts as an important part of their job and were worried that the new system would reduce its role in their work (Huryk 2010; McGinn et al. 2011; Gagnon et al. 2012; Brewster et al. 2014).

Besides clear errors in the system, a mismatch between the system and the workflow was also seen as problematic. Berg (2001) stresses that functionalities of a good system should match with the "needs and working patterns of the organization". At the same time, Berg also notes that "it is not possible to maximize IT's contribution to organizations without affecting the very nature of these organizations". However, things like not being able to install the software (Brewster et al. 2014) or to input historical medical record data gathered prior to the software (Kruse and Beane 2018) hinder the transformation process. Moreover, if the software "undermines professional autonomy", it is "likely to be resisted by users" (Cresswell and Sheikh 2013).

Generally, hindrances related to performance expectancy culminate to one simple question: "how does the system benefit me?" If the system is not perceived as useful (Kruse et al. 2016; Brewster et al. 2014) or no evidence of the system's benefits are presented (McGinn et al. 2011; Gagnon et al. 2012), its acceptance is hindered. The same happens if the system is seen as lessening clinical productivity or is actually proven to do so (Kruse et al. 2016; McGinn et al. 2011). According to McGinn et al. (2011), this happens particularly during the transition period to the system.

2.3.2.3 UTAUT: Facilitating conditions

Table 2.8: Hindrances related to facilitating conditions

Hindrance	**Sources**
Lack of interoperability / integrations	McGinn et al. 2011; Kruse et al. 2016; Cresswell and Sheikh 2013; Brewster et al. 2014
Cost issues	McGinn et al. 2011; Kruse et al. 2016
Financial incentives	Kruse et al. 2016; Cresswell and Sheikh 2013
Technical infrastructure	Kruse et al. 2016; Huryk 2010
Facility location	Kruse et al. 2016
Race and income disparities	Kruse et al. 2016
Staff shortages	Kruse et al. 2016
Technical support	Kruse et al. 2016

The hindrances related to facilitating conditions are shown in Table 2.8. The new system not being able to operate with the existing ones often came up. McGinn et al. (2011) on this: "inadequate interfacing with other IT systems was perceived as a barrier by users, and in some cases led to negative outcomes". The topic of money also came up. According to McGinn et al., patients and HCPs were worried about high costs in general, whereas managers and physicians expressed concern about lack of resources and funding as well as maintenance costs. The financial incentives to actually use the system were also mentioned (Kruse et al. 2016; Cresswell and Sheikh 2013). Infrastructure-related viewpoints were offered from multiple angles. Huryk (2010) mentions system slowness and downtime as well as lack of available computers. Then again, lack of available workforce and technical support are mentioned by Kruse et al. (2016) as hindrances. They also mention race and income disparities and facility location as potential hindrances.

2.3.2.4 UTAUT: Social influence

Table 2.9: Hindrances related to social influence

Hindrance	**Sources**
Attitudes of colleagues about system	McGinn et al. 2011; Gagnon et al. 2012; Huryk 2010; Cresswell and Sheikh 2013
Superiors' attitudes	Kruse et al. 2016; Huryk 2010; Cresswell and Sheikh 2013; Brewster et al. 2014
Role boundaries / interprofessional relationship	Gagnon et al. 2012; Ward et al. 2008; Cresswell and Sheikh 2013
Competition	McGinn et al. 2011; Kruse et al. 2016
International medical graduates less likely to adopt	Kruse et al. 2016
Management forcefully implementing system	McGinn et al. 2011
Penalties	Kruse et al. 2016

The hindrances related to social influence are shown in Table 2.9. Negative attitudes by both colleagues and superiors worked as hindrances. As a case example, Huryk (2010) recounts a study by Shoham and Gonen (2008) where nurses reported that "their head nurses held the most influence over their behaviour". Moreover, changes to role boundaries were perceived as a hindrance. Indeed, the system "inadvertently undermin[ing]" perceived social standing is likely to cause resistance in the users (Cresswell and Sheikh 2013), and as such "acknowledgement of the impact on staff roles is also essential to ensure that changes are carefully managed" (Brewster et al. 2014). Competitiveness among the users might also hinder acceptance (McGinn et al. 2011; Kruse et al. 2016).

A forceful managerial approach to implementation was also found to be a contributor in failing implementations (McGinn et al. 2011). In addition, Kruse et al. (2016) found using penalties and the lack of participation by international medical graduates to be hindrances in implementation.

2.3.2.5 Other: Organizational

Table 2.10: Hindrances related to organizational aspects

Hindrance	**Sources**
Not involving end users in planning	McGinn et al. 2011; Berg 2001; Huryk 2010; Peute et al. 2010; Cresswell and Sheikh 2013
Clarity of policies	Kruse et al. 2016; Huryk 2010
Eligibility criteria	Kruse et al. 2016
Maintenance / ongoing costs	Kruse et al. 2016
ROI uncertainty	Kruse et al. 2016

Some hindrances revolved around organizational issues, as shown in Table 2.10. Not involving end users in planning was often mentioned. Peute et al. (2010) highlight the two main problems that may be caused if end users are not involved. Firstly, it may result in problems in the system design itself. Secondly, it might erode the trust of the users in the system as well as their interest in actually using the system. Kruse and Beane (2018) also mention the difficulties in meeting meaningful use and eligibility criteria as a hindrance.

Some organizational issues pertained to the financial dimension. Kruse et al. (2016) highlight that physicians are worried about maintenance costs and at the same time uncertain, whether the returns on investment will prove to be adequate. From the users' viewpoint, policies being unclear may hinder implementation (Huryk 2010; Kruse et al. 2016). Resistant users are "concerned about the reimbursement and legal implications of making decisions based upon a computer", Huryk (2010) notes. This ties to the notion made by Kruse et al. (2016): "the policies and incentives for healthcare organizations" shape the appeal of digital systems, especially to "older physicians, organizations that deal with large populations of low-income patients, and certain [U.S.] states that have lower adoption rates".

2.3.2.6 Other: Miscellaneous

Table 2.11: Miscellaneous hindrances

Hindrance	**Sources**
Privacy and security concerns	McGinn et al. 2011; Gagnon et al. 2012; Ward et al. 2008
Ability to make changes	Kruse et al. 2016
Ethical issues	McGinn et al. 2011
External factors	Kruse et al. 2016
Observability	McGinn et al. 2011
Provider or patient age	Kruse et al. 2016
System interferes with values, aspirations or roles	Cresswell and Sheikh 2013

Table 2.11 describes miscellaneous hindrances, which did not fit in any of the above categories but did not warrant their own either. Privacy and security concerns were pointed out in many articles (McGinn et al. 2011; Gagnon et al. 2012; Ward et al. 2008). Citing Greenhalgh et al (2008), McGinn et al. (2011) propose that new healthcare systems might even require redefining privacy altogether: whereas previously it could be described as "a property of the individual doctor-patient relationship, mediated by the human qualities of the doctor", contemporary healthcare would define it as "a property of the system as a whole, mediated by technical and operational security measures". Somewhat related to this, McGinn et al. also highlight ethical issues being potential hindrances. In addition, they mention the fact that HCP work can be observed ("observability") throughout as a hindrance. On a higher level, these relate to the phenomenon Cresswell and Sheikh (2013) mention, where the system interferes with pre-existing values, aspirations and roles, making its HCP acceptance challenging.

Kruse et al. (2016) mention the provider or patient age as being a hindrance, as well as their ability to make changes in the system. As a sort of a catch-all factor, "external factors" is also given as a hindrance, without going into more detail about what it actually entails.

2.4 Training technology use

While implementation determinants are well documented on the system and organization levels, less attention has been paid to intervention-level determinants (Lyon and Bruns 2019). In a meta-analysis conducted by Dopp in 2018 (as cited in Lyon and Bruns 2019), 3 out of 73 strategies for implementing health care primarily targeted interventions. While the strategies for interventions are many, it is not feasible to utilize all of them in the scope of this thesis. Therefore this thesis will focus on only one form of intervention, *end-user trainings*. Creating "favorable user reactions to new technologies" is difficult and "insufficient or ineffective training" is a key factor contributing to this (Venkatesh 1999). In a 2001 literature review by Chou training was identified as a "critical factor in information system implementation" and "one of the controllable variables that could affect the success or failure of EUC [end-user computing]". Similarly, Compeau and Higgins (1995a) posit that "training is positively related to success", referring to existing research on systems implementation and end-user computing. Moreover, Marshall et al. (2008) propose a link between end-user training and the UTAUT constructs of effort expectancy and performance expectancy. Therefore it seems justified to focus on trainings as a method of intervention in this thesis. It should be noted, however, that "only about 50% of training investments result in an improvement in employees and the organization" (Saks 2002). While this does not undo the importance of trainings in successful implementations, it does imply that investing resources into trainings does not automatically guarantee success.

This thesis follows the definition by Nelson and Cheney (1987), where the word 'training' is used when referring "to formal efforts to transfer required IS knowledge". Bostrom et al. (1990) posit that central to the way users interact with systems is the *mental model* they have formed of it. By a mental model, they refer to the user's "internal representation of the system structure and function that provides explanatory power". Moreover, Bostrom et al. postulate that this mental model can be formed by utilizing one or more of these three mappings: (1) *mapping via usage*, where the user creates the model by using the system; (2) *mapping via analogy*, where the model is created by "drawing analogies from similar systems that are

familiar to them"; (3) *mapping via training*, where the mental model is acquired through training. Furthermore, Bostrom et al. highlight two dimensions that pertain to how trainings are done. The first dimension relates to how conceptual the trainings are (abstract versus analogical). Analogical models "represent the target software in terms of another system", while abstract ones are "synthetic representations of the target software". Another important dimension relates to training approach and whether the trainings are more "applications-based" or "construct-based". Paraphrasing Davis (1989), Bostrom et al. differentiate them as follows: applications-based training is exploration-oriented — "inductive, trial and error, high learner control, incomplete learning materials, relevant task focus". Construct-based training, on the other hand, is instruction-oriented — "deductive, programmed, low learner control, complete materials, features focus". These dimensions have been summarized in Figure 2.2, adapted from Chou (2001).

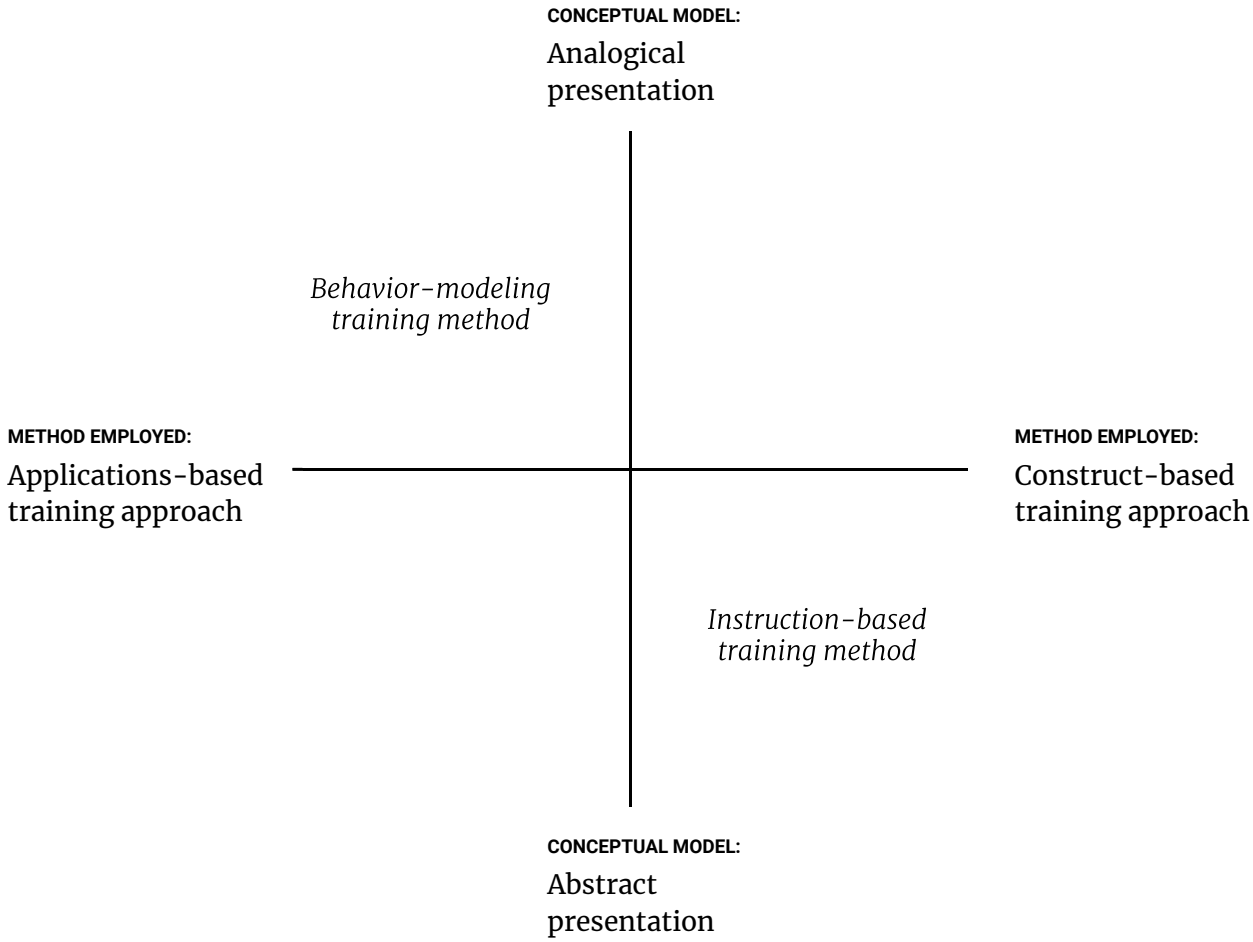

Figure 2.2: The training methods defined by Bostrom et al. (1990), as adapted from Chou (2001)

More specifically, the training method used in this study is *behavior modeling training* (BMT). With respect to the dimensions described in Bostrom et al. (1990), BMT utilizes mapping via usage and mapping via training, but not mapping via analogy. In summary, behavior modeling training is a way of training people to learn certain things by modeling the desired behavior to them. It is based on Bandura's (1971) idea of social learning theory. Bandura posits that "new patterns of behavior can be acquired through direct experience or by observing the behavior of others". As summarized by Taylor et al. (2005), there are four aspects that

Bandura proposes as being influences in learning the modeled behavior. These aspects are (1) the modeled behaviors itself, (2) the way the behaviors are displayed, (3) the model (e.g. trainer) and (4) the learner. Changing the characteristics of these aspects, such as "how distinctively [the key behaviors] are modeled" affects the "extent to which a learner attends the modeled behavior". As outlined by Chou (2001), both earlier research on behavior modeling as well as their own research have found behavior modeling to be superior to instruction-based approaches on learning performance and efficacy. This is why BMT was chosen as the training method for this thesis.

The actual best practices regarding doing BMT have been analyzed in a meta-analysis by Taylor et al. (2005). These are used as a basis for the empirical research of this study, and are summarized below:

- Present learning points as rules to be followed
- Use mixed models ("correct" and "incorrect" use of the software), unless you are teaching technical skills in which case using only positive models might be appropriate
- Ask trainees to rehearse mentally just before the behavioral rehearsal
- Practice work-related scenarios trainees develop themselves
- Set goals at the end of the training / train trainees' superiors / introduce rewards or sanctions for trainees' daily work

Presenting learning points as rules to be followed — "do [some behavior]" — "yields large effects on trainees' development of procedural knowledge skills". By procedural knowledge Taylor et al. (2005) refer to "skills assessed in simulation tasks or through paper-and-pencil situational judgment tests". Regarding the presentation of the actual behavior in the software, mixed models were preferred in general for training transfer, meaning "[the] size of training effects for changes in job behavior". By "mixed models" Taylor et al. refer to the idea that if the trainees are also shown how the software should not be used, hence increasing their ability to generalize their skills. They noted, however, that mixed models "were not superior to positive-only models in producing changes in trainees' attitudes", and that they were "inferior to positive-only models in improving trainees' declarative knowledge".

Besides, especially in teaching technical skills, "where there may be only single behavioral options for achieving particular tasks, the inclusion of negative models might not be appropriate". A small benefit for procedural knowledge skills was also found when the trainees were asked to mentally rehearse the situations before the actual hands-on training. Taylor et al. note that coaching the trainees on how they should apply these skills did not produce any changes but that that may be attributed to a methodological artifact. These rehearsed situations should be developed by the trainees themselves, Taylor et al. describe and assert that the finding is consistent with prior research.

The number of hours used for the training is often considered as an essential factor in BMT, but Taylor et al. (2005) partially dispute this. A positive association is found between the amount of practice trainees receive and the development of procedural knowledge skills. However, "a near-zero relationship" is found between the hours used for training and the extent of training transfer. They hypothesize that "lack of sufficient variability in practice conditions" might be the cause of this. Moreover, they posit that lengthy BMT programs with highly similar training sessions might not be warranted. Regarding enhancing the training's effects after the training itself, three methods were identified. Firstly, setting goals was found to produce "slightly larger" changes in job behavior. The "lack of more pronounced differences" is speculated to be related to weaknesses in the execution of the study itself. Secondly, training trainees' superiors was strongly associated with positive effects concerning changes in job behavior. This was linked to both the superiors being more able to provide support as well as "providing social reinforcement when trainees use skills on the job". Thirdly, giving rewards or sanctions to trainees for using the newly trained skills at the job was associated with large effects on job behavior. These could include, for example, including the new skills in performance appraisals as well as encouraging superiors to direct and reinforce their employees in using the skills.

Chapter 3

Methods and material

This chapter goes through the methodology and the materials of the study. First, an overview of the research approach is given. The process of action research and its application in this study are described. On a more general level, justifications for the qualitative and interpretive approaches are given. Afterwards, the research subjects and their selection criteria are detailed. The use of theme interviews for data collection is motivated and explained, after which the same is done for the trainings given as part of the thesis. To conclude, the analysis process for the collected data is explained. A summary of the phases of the empirical research is given in Chapter 3.

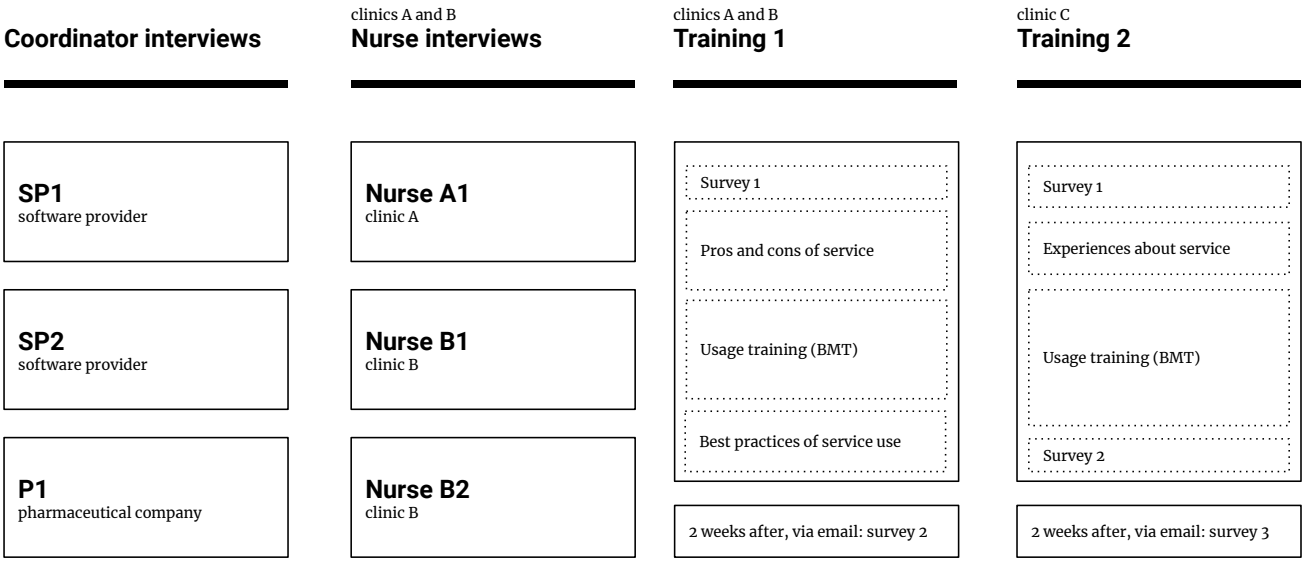

Figure 3.1: The four different phases of the empirical research of this study

3.1 Research approach

This study aims to supplement the findings of literature by gathering real-world empirical data on the topic. On a more specific level, it is done as an exploratory case study using action research as the chosen methodology. Exploratory here refers to the intent to "find out how people get along in the setting under question, what meanings they give to their actions, and what issues concern them" (Schutt 2018, p. 13). The case study, on the other hand, was chosen because case studies "are the preferred strategy when 'how' or 'why' questions are being posed" (Yin 1984, p. 1). While RQ1 and RQ2 look at "what" factors enable and hinder nurses' behavioral intention, the answers to these questions are sought by looking into how the subjects themselves see the issue. "Case study" in this thesis is defined as "an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, program or system in a 'real life' context" (Simons 2009, p. 21). However, as emphasized by Thomas (2011), "the case study should not be seen as a method in and of itself". This in an important point to make in respect to this thesis, because many existing studies portray action research and case study as alternative methodologies (see e.g. Baskerville 1997; Blichfeldt and Andersen 2006). Case study is a "design frame that may incorporate a number of methods" (Thomas 2011). In this thesis, the case study can be seen as a tool to gather real-world data in a manner that is based on prior research. At the same time, the gathered empirical findings are contrasted with existing research, further contributing to research at large. The practical methodology chosen for actually doing this, then again, is action research.

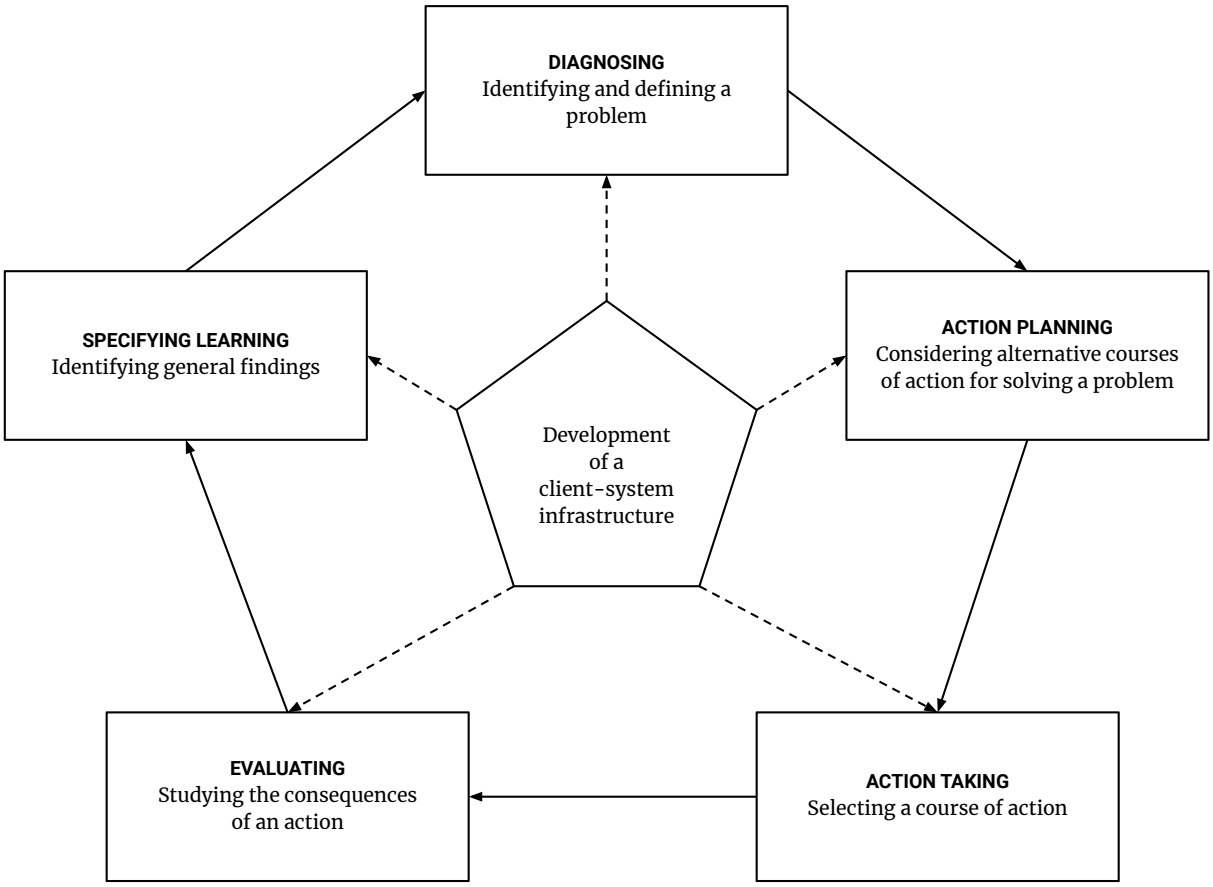

Figure 3.2: "The cyclical process of action research", as adapted from Susman and Evered (1978)

The chosen methodology of action research can be described as an "iterative process involving researchers and practitioners acting together on a particular cycle of activities, including problem diagnosis, action intervention, and reflective learning" (Avison et al. 1999). According to Avison et al. (2018), the benefits of action research are most visible in "the investigation of complex, real-life problem situations that also encompass primary [information system] concerns within organizations". The research questions of this study are aimed to study one such real-life problem situation, the implementation of new technology in public sector healthcare. It is

an environment full of different contexts, mindsets, hierarchical structures, existing technologies and other variables that are difficult to control. This makes action research a fitting methodology and consequently the one that is used in this thesis.

More specifically, this thesis follows the cyclical process proposed by Susman and Evered (1978). As illustrated in Figure 3.2, one cycle contains five phases: diagnosing, action planning, action taking, evaluating and specifying learning. These were implemented in this thesis as follows:

Cycle 1

- *Diagnosis*: 6 subjects were interviewed to form an understanding of the problem at hand.
- *Action planning*: After considering different approaches, a training was chosen as the actionable intervention. A structure for the training was devised based on the findings from the interviews and the literature review.
- *Action taking*: A training was held at Clinic A
- *Evaluating*: The training participants' feedback as well as observations from the training were analyzed to see what worked and what did not
- *Specifying learning*: Findings were used to suggest improvements for the next training as well as to reflect upon the chosen research questions

Cycle 2

- *Diagnosis*: The findings of the first training suggested some changes to be made to the second training
- *Action planning*: The structure of the second training was changed according to the findings from the first one
- *Action taking*: A training was held at Clinic C
- *Evaluating*: The training participants' feedback as well as observations from the training were analyzed to see what worked and what did not
- *Specifying learning*: Findings were used to answer the research questions as well as give suggestions for future trainings

On a broader scale, this thesis is built upon the traditions of qualitative and interpretive research. Qualitative research is not an unambiguous concept, instead being more of a "complex, interconnected family of terms, concepts, and assumptions surrounding the term qualitative research" (Denzin and Lincoln 2017, p. 41). Nevertheless, qualitative research methods are "designed to help us understand people and the social and cultural contexts within which they live" (Myers and Avison 2002, p. 4). Often these methods aim to unravel the phenomenon by approaching it from the perspective of those involved. The qualitative researcher is often interested in "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" (Merriam and Tisdell 2015, p. 6). Indeed, if the goal is to understand people's daily behavior and to find detail in things such as people's understandings and interactions, the qualitative approach can be seen as apt (Silverman and Marvasti 2008, pp. 9, 14). Based on these arguments, the qualitative approach was chosen for this thesis.

Looking at previous studies on the subject at hand can guide the selection of a methodology to the right direction (Silverman 2013). A meta-analysis of UTAUT studies by Williams et al. 2015 analyzed 174 papers, of which 102 were quantitative in nature. In contrast with this thesis's chosen methodology, this would suggest a tendency for UTAUT-oriented studies to be quantitative, possibly because many of the studies mentioned aim to validate or analyze UTAUT itself. This study operates on the premise that UTAUT is rigorous enough to use, only using it as a tool to construct the research. Besides, while not talking explicitly about quantitative studies (Galliers 1990) highlight the fact that traditional, statistics-driven empirical approaches have historically been the *modus operandi* of information systems research, perhaps "at the expense of less conventional approaches that nevertheless provide important contributions to our search for improved knowledge". While the situation seems to have progressed in the three decades following the article by Galliers (refer to f.ex. Chen and Hirschheim 2004), this tradition might also be a partial explanation for the quantitative tilt.

As outlined by Myers and Avison (2002, p. 5), "all research (whether quantitative or qualitative) is based on some underlying assumptions about what constitutes 'valid' research and which research methods are appropriate". They further explain how a

prerequisite of doing qualitative research is "knowing what these (sometimes hidden) assumptions are". The epistemological stance taken in this thesis is interpretivism, that is, the assumption that "access to reality (given or socially constructed) is only through social constructions such as language, consciousness and shared meanings", as defined by Myers and Avison. This is in contrast with two other stances Myers and Avison have adapted from Chua (1986): positivist research, which premises the "existence of a priori fixed relationships within phenomena" ("a truth to be uncovered") and critical research, which "tries to transform alienating and restrictive social conditions" by exposing "deep-seated, structural contradictions within social systems". However, as highlighted by Myers and Avison, distinguishing between the three categories is "not always so clear-cut".

Interpretive research attempts to "understand phenomena through accessing the meanings that participants assign to them" (Orlikowski 2000). There are two major factors in the design of this research that would support an interpretive approach, the design of the interview phase as well as the nature of the intervention phase. This thesis tries to understand the factors affecting technology implementation from the stakeholders' (software provider employees, healthcare personnel) own perspectives. What do they deem important? Why? The thesis does not suggest the existence of a priori relationships — or "a singular truth" — about how implementations should be done. Moreover, the nature of action research precludes pure observation: in the intervention phase, the researcher not only conducts the research, but also actively participates in it. Both of these factors can be said to be congruent with the characteristics of the interpretive paradigm, which is why it is the epistemological stance taken in this thesis.

While the researcher has opted for an interpretivist viewpoint and in general qualitative researchers "tend to use a nonpositivist model of reality" (Silverman 2013, p. 14), it should be noted that "both qualitative and quantitative methods may be used appropriately with any research paradigm" (Guba and Lincoln 1994). An example of this could be Yin's (1984) positivist approach to case studies. Do note that while Yin's general approach towards case studies can be seen as positivist, their basic idea that "case studies are the preferred research strategy to answer 'how' and 'why' questions would also be accepted by the interpretive school"

(Walsham 1995), which is why it was used to justify the usage of case studies in this study. The case study descriptions include the factors posited by Walsham (1995): "details of the research sites chosen, the reasons for this choice, the number of people who were interviewed, what hierarchical or professional positions they occupied, what other data sources were used, and over what period the research was conducted". Walsham's advice is also used in reporting about the data analysis. Hence, recording methods, analysis methods and the evolution of the "iterative process between field data and theory" will be outlined.

3.2 Data collection

This section aims to give the reader an overview of the practical context of the empirical study. First, the interviewees and their selection process will be explained. At this point, the motivation for using theme interviews will be given. Having described the interview phase, the section will provide a similar overview of the action phase. The selected clinics and their selection will be explained, after which the selected methodology for crafting the intervention will be described in detail.

3.2.1 Research subject descriptions

When selecting the subjects for the interviews and the trainings, a few points guided the selection process. All of the nurses and clinics were Finnish, because Kaiku Health Ltd. currently has the majority of its operations in Finland. Besides, Kujala et al. (2018) note that experiences about the practices supporting implementation seem to be very similar in Finnish and global research projects. Hence, the focus on Finnish nurses was not seen as a problem. In addition, one aim was to have all the research subjects work with oncology one way or the other. This was done both because Kaiku Health Ltd. explicitly requested it and because oncology is one of the largest user groups of the Kaiku Health -service. Experience of medical treatment and a public healthcare context were also selection criteria, to ensure

that the workflows between the HCPs would not differ considerably.

3.2.1.1 Software provider

The software provider is a Finnish health care IT company founded in the 2010s. It offers a software-as-a-service product for both public and private medical institutions in the fields of oncology, fertility care and occupational health. The company currently has over 60 active customer sites. Most of the sites are in Finland, but the company has been expanding its growth in other markets on an increasing rate, having customer sites for example in Germany and Switzerland. Currently the company employs around 30 employees, making it a *small-to-medium enterprise* (SME; EU Commission 2004).

During the thesis the researcher was also employed at the software provider, having worked there from June 2018.

3.2.1.2 Case clinics

The case clinics are presented below. However, to avoid identification of the clinics and nurses, information such as the exact size and the general location have been left out. Otherwise, recognizing the clinics in question might have been possible due to Finland's relatively small size and low amount of hospitals. The three clinics below were chosen for a few reasons. They were easily available, helping the researcher to organize the trainings for nurses, who by default have quite busy schedules. In addition, all of them had used the Kaiku Health -service for a while, but with different experiences. Clinic A and Clinic C had had some hurdles in their usage of the software, while the processes at Clinic B seemingly meshed very well with the Kaiku Health -service. All of these factors made the chosen clinics interesting subjects for the aims of this research.

Clinic A is the hematology ward of a large Finnish hospital. The hospital district Clinic A is situated in offers care to hundreds of thousands of patients.

Hematological wards such as this one specialize in all hematological (i.e. blood) illnesses such as leukemias, myeloma and lymphoma. The healthcare professionals working at Clinic A work in cycles, where nurses work 6–9 weeks in the outpatient ward and after that a similar time period in the inpatient ward. This means that while the nurses do not exclusively work in oncology, they do treat patients with cancers. In the case of the Kaiku Health -service, the cancer patients are primarily multiple myeloma patients, which is a type of cancer affecting the plasma cells of the body. The first users from Clinic A registered to the Kaiku Health -service in May 2017. Because they are in the same hospital district, clinics A and B are represented in the system as belonging in the same group. For this reason, the users of A and B cannot be distinguished in the service. Altogether, however, clinics A and B have 18 HCP users and 32 patient users registered to the service.

Clinic B is the hematology ward of a smaller Finnish hospital, which is situated in the same hospital district as Clinic A. Clinic B also specializes in hematological illnesses. At Clinic B, the distribution of work shifts is not as clearly defined in cycles as at Clinic A. However, nurses do work both at the outpatient ward and inpatient ward, a bit depending on their duties. For example, the nurses interviewed for this thesis (Nurse B1 and Nurse B2, further described in Section 3.2.1.3) worked in the hematology outpatient ward, the hematology inpatient ward and the internal medicine ward. Mostly, however, they worked on the hematology outpatient ward. Patients come to Clinic B either with a doctor's referral or as urgent consultation cases from specialized fields of medicine. The first users from Clinic B registered to the Kaiku Health -service in May 2017, the same time as from Clinic A.

Clinic C is the gynaecology and obstetrics (maternity) ward of a Finnish hospital. Clinic C belongs to a different hospital district than Clinics A and B, one that is approximately half the size of the one Clinics A and B are in. The first users from Clinic C registered to the Kaiku Health -service in October 2018 and currently there are 10 HCP users and 44 patient users registered.

3.2.1.3 Interviewees

Interviewee	Place of employment	Role
SP1	Software provider	Strategic development and sales work, formerly a lot of end-user work as well as trainings
SP2	Software provider	Trainings, customer communications
P1	Pharmaceutical company	Medical professional
Nurse A1	Clinic A	Hematology nurse
Nurse B1	Clinic B	Hematology nurse
Nurse B2	Clinic B	Hematology nurse

Table 3.1: The interviewees categorized by context

The selected interviewees and their contexts are described in Table 3.1. The interviewees can be roughly divided in two groups: 3 coordinators (SP1, SP2, P1) and 3 end users (Nurse A1, Nurse B1, Nurse B2). Coordinators in this thesis are defined as people who aid end users in using the software, but do not themselves use the software in their daily work. As per Stevenson (2010), an end user can be defined as "the person who actually uses a particular product". It should be noted that technically this definition does include patient and doctor users as well, but this thesis focuses only on the nurse users.

The most immediate context for finding coordinators was the software provider. Both SP1 and SP2 are software provider employees. SP1 is a long-term employee, whose work currently consists largely of strategic development and sales work. However, over the years SP1 has worked extensively with the end users and as such was chosen to provide a more long-term view of the topic at hand. To complement this, SP2 was chosen as the second interviewee from the software company. SP2's daily work consists of communicating with the customers as well as organizing training sessions for the nurses and other customer-facing communication tasks.

SP2, then, was selected to provide research with insights "from the working floor". All interviews were conducted between November 2018 – January 2019.

To further understand technology adoption in clinics from the point of view of an external party, one interviewee was selected from outside of the company. P1 works as a medical professional at an international pharmaceutical company that is a partner of the software provider company. The interviewee has been involved in the implementation of the Kaiku Health service on the clinic side, but has not had any communications with Kaiku Health end users. However, P1 has experience of multiple other technology implementation projects in healthcare contexts. All in all, their views provide a wider view into technology implementation in clinical contexts in Finland.

The three nurses interviewed were all from the same hospital district, but from different branches. All nurses worked in the hematology department of their respective branches. Nurse A1 works in rotating shifts, alternating between working at the outpatient department and the inpatient department on regular intervals, usually of a few weeks. Nurse B1 and Nurse B2 primarily do outpatient department work, but every now and then also work at the inpatient department. At the inpatient department, the service is not used. All of the three nurses felt that they were in general reasonably active users of the Kaiku Health -service, which may bias the answers gotten from the interviews. While there were less experienced users among the prospective interviewees, they did not answer the researcher's emails and hence were not able to be interviewed.

3.2.2 Theme interviews

The data collected in the first phase of an action research study can be collected in a multitude of ways, including interviews (Lau 1999). In this thesis, data is collected using theme interviews (Hirsjärvi and Hurme 2008, p. 47). They are semi-structured interviews that do not rely on a structured set of questions to be asked, instead focusing on pre-specified themes. Theme interviews as a method emphasize the role of the interviewee as a subject, who actively creates meanings

around the topic in question (Hirsjärvi and Hurme 2008, p. 48). This is in line with the interpretive stance of the thesis. The aims of this thesis also align with other benefits of using interviews, as outlined by Hirsjärvi and Hurme (2008, p. 35): the experiences of the interviewees are meant to be situated in a wider context, it is known beforehand that the topic at hand produces complex and multidimensional answers and that these answers often need clarification. Hirsjärvi and Hurme also mention that if the topic is relatively unknown, interviews work well as a data collection method. This also applies to this thesis, since as mentioned in Section 2.2 while technology adoption *per se* is relatively well-researched, intervention-level changes are seldom focused on (Lyon and Bruns 2019). Conducting interviews does require skill and experience from the researcher (Hirsjärvi and Hurme 2008). In this case, the researcher does a lot of interviews as part of their professional work as user experience designer which was also a factor affecting the selection of interviews as a data collection method. Interviews also require finding a balance between "excessive passivity" and "over-direction" (Walsham 1995). While the professionality of the interviewer plays a large role in this, the semi-structured nature of theme interviews also helps in reducing the risks of leaning too much into either direction.

Table 3.2: Interview structure and objectives

Section	**Objective**	**RQ(s)**
Introduction	Introduce the topic and the aims of the thesis. Go through the interview structure and other practicalities. Ask for permission to record the interview.	-
Background of the interviewee	Find out more about the interviewee, their daily work and role in the organization.	-
Theme I: Nurses' feelings about the service	Get an overview of how nurses feel about the Kaiku Health -service in general, identify different factors causing these feelings.	RQ1, RQ2
Theme II: Service usage at the clinic	Increase understanding of how daily work has changed after the service has been taken into use. Speculate optimal future scenarios.	RQ1, RQ2
Theme III: Service implementation at the clinic	Find out how the service has been implemented and how that process is perceived. Identify implementation-related factors affecting the feelings about the service.	RQ1, RQ2, RQ3
Additional thoughts, comments about interview	Give the possibility for the interviewee to comment on things that were not asked. Get feedback about how the interview was done.	-

The structure of the interview is outlined in Table 3.2. In addition, the objectives for each section are specified as well as what research questions the sections are related to. The coordinator interviews were centered around three themes: (1) Nurses' feelings about the Kaiku software, (2) its usage in daily work and (3) its implementation at the clinic. As advised by Hirsjärvi and Hurme (2008, p. 66), the chosen themes stem from the relevant theoretical literature. Besides, the interviews for the nurses were modified based upon the findings from the coordinator interviews. This aligns with the view proposed by Gibbs (2018, p. 3), where the analysis of

early data can be used to raise new research issues and questions. These changes are described in Section 4.1.

It should be noted that the perspective from which the themes were approached depended on the interviewee. When interviewing nurses, the questions were related to their actual experiences of using the Kaiku Health -service and the feelings related to that. While the questions for the software provider employees were the same, the answers were second-hand information about how they perceive the current situation at the clinic. Undoubtedly, many if not most of these perceptions are based on actual correspondence with nurses over the years. Nevertheless, this difference is still important to remember when analyzing the data. For the pharmaceutical company employee, the questions were asked in a more general format. Instead of a Kaiku Health -service -specific view, the employee was asked about implementation of new technologies in the cases they had worked with.

All interviews were recorded for transcription purposes. The transcriptions were not verbatim and conversational features such as verbal tics and repetitions have been left out. As described by Gibbs (2018), "tidying up" the transcript is reasonable, when the study is more concerned with what is said instead of "the details of expression and language use". Altogether there were approximately 4 hours and 50 minutes of recordings, that were transcribed into approximately 37 pages of notes.

3.2.3 Action phase

The action phase had several goals. One aim was to gather qualitative data in a different way than in the theme interviews, forming a more comprehensive view of the issues at hand. A central point in the way the trainings were done was the utilization of behavior modeling training (BMT). Section 2.4 elaborates on the ways of how BMT should be done, as specified in the meta-analysis by Taylor et al. (2005). Advice from this meta-analysis was followed in how BMT was done in this study, namely: negative models were not included due to this being a more technical training, trainees helped develop some of the scenarios (in Training 2) and

learning points were described to the trainees. Besides giving an in-depth outlook on the best practices, Section 2.4 also further details the benefits of BMT from the technology acceptance viewpoint. However, BMT also has some advantages from a data collection viewpoint. Reproducing the shown behavior in practice is an essential part of the BMT method. Hence, participants actually used the Kaiku Health -service instead of just recounting past experiences or speculating on future ones, as was the case in the interviews. A similar approach has been taken in another field of research, usability testing. Barnum (2010, pp. 9-10) describes the benefits of usability testing as getting to "see what people actually do — what works for them, and what does not — not what we think they would do or even what *they* think they would do if they were using your product". What follows, Barnum continues, is a way to learn more about the user's "wishes and hopes for the product" as well as "how well the product supports them in their goals". While BMT is not usability testing *per se*, it still shares the same traits of users using the software in practice and hence looking for similar insights seems reasonable. In addition, the qualitative data from the open-ended questions in the feedback surveys in both trainings sheds more light on the trainees' thoughts.

Measuring the outcomes of the training was also an intended goal. Multiple methods were tried for this. For the first training, the chosen method was measuring changes in computer self-efficacy. CSE was chosen because it "was found to exert a significant influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers (affect and anxiety), as well as their actual computer use" (Compeau and Higgins 1995b). Similarly, motivation to use (as described in Bostrom et al. 1990), measured by the change in behavioral intention (BI), was a point of interest in the second training. In addition, usage data was supposed to aid in evaluating the outcomes. However, considering the quantitative nature of each of these metrics and the relatively low amount of participants in both workshops, they were ultimately left out. As such, they will not be analyzed further in the thesis. Instead, the content of the workshops is only analyzed qualitatively. This supports the qualitative angle of the thesis and shifts the focus from evaluating the training outcomes towards understanding the participants' motivational factors by supplementing the interviews with different forms of data collection.

3.2.3.1 First training (Clinics A and B)

The first training was held at the end of 2019. People from both Clinic A and Clinic B were invited, since the training was part of a larger full-day event aimed at hematology personnel from the hospital district. Hence, personnel from both clinics were invited since they belong to the same hospital district. 7 people were present in the training: 6 nurses and 1 doctor, including Nurse A1, Nurse B1, and Nurse B2, the nurses interviewed in the diagnosis phase of this AR cycle. In addition, P1 and another employee from the same pharmaceutical company participated because the larger event was sponsored by the pharmaceutical company. Since the original setup did not include them in the training, their experiences of the training are not relevant for this thesis and have therefore been left out when evaluating the training. However, since they were already present, the researcher did not see any reason to exclude them from the training. Despite the full-day event not being organized by Kaiku Health Ltd., the researcher had a *carte blanche* to design the training, with no requirements being given by the sponsor. In addition to the the aforementioned people, two employees from Kaiku Health Ltd. were present in the training to help the researcher with the interactive part of the training, making 12 the total number of people present.

The venue for the training was a conference room situated in a building nearby the clinic. It had been rented by the pharmaceutical company. The space had one screen that the researcher used to show visual materials as well as model the software during the training. This is in line with an average Kaiku Health -service training — often trainings are held in conference rooms with one screen and no computers for the participants. Two tablets and two laptops were brought to be used for the interactive part of the training.

The first training itself consisted of four parts, and an additional survey was sent by email two weeks after the training. The training structure, the time allocated and used for each part as well as notes are listed in Table 3.3.

Table 3.3: Structure of the first training

Section	**Planned time**	**Used time**	**Notes**
Computer self-efficacy (CSE) survey 1; asking for written permission to collect usage data	5 min	5 min	Left out from the second training due to data not being suitable to answer RQs
The pros and cons of the service	30 min	30 min	Due to time concerns this was modified for the second training to be more informal, shorter
Interactive training	60 min	60 min	Modelling left out due to lack of time; has to be included in second training
Tips for service usage in the future	20 min	5 min	Lack of time led to hasty walk-through
Two weeks after the training, via email: CSE survey 2; asking for general feedback and extension of the usage data collection permission	-	-	CSE and usage data left out as mentioned; general feedback was kept

First off, the participants were given two papers (Appendix B). One contained a modified computer self-efficacy (CSE) survey, as adapted from Compeau and Higgins (1995a). The other, then again, asked for permission to collect and use the participant's Kaiku usage data from the following two weeks. Each of the seven HCP participants agreed upon their data being used in this thesis, but both the usage data and the CSE survey were ultimately left out of the analysis.

After the papers had been filled and collected back, the participants were separated into different groups. It was suggested the participants should find a partner that they were not too familiar with beforehand. In the end the groups ended up in these combinations: nurse + nurse, nurse + nurse, nurse + nurse + doctor, pharma

employee + pharma employee. They were then first asked to write positive things about the Kaiku Health -service on sticky notes. The same was done with negative things. Both of these exercises took approximately 5 minutes. The sticky notes were collected by the researcher on a wall everyone could see, and subsequently categorized into different larger themes on the wall. Each sticky note was read aloud and potential questions or comments were asked from the participants. Afterwards, the negative aspects of the software were categorized similarly. In addition, the negative aspects were analyzed together, with the goal of finding a way to alleviate the found problems. These suggestions were not made by the researcher, but instead asked from the participants themselves and written down. On one hand, the goal of the first part was to find out how the participants were feeling about the Kaiku Health -service, having either used it in their daily work or having decided to avoid using it or to not use it at all. On the other hand, it was a way to relieve tension in a group situation and to familiarize the participants with each other.

For the interactive part of the training, the idea was to follow the behavior modeling training structure: first showing how the tasks are done and then making the participants do them themselves. However, the researcher did not model these tasks on screen first as was the initial idea. The reason for this was that the training started 30 minutes late, and therefore something needed to be left out. Since most of the participants had used the service before, this part was deemed the least important in the training. As an exception, participants were shown the process of what happens after a staff user has invited a patient to the service. This is something that cannot be done in the test version of the software because of technical reasons.

After the patient registration process was shown, four digital devices (two tablets, two laptops) logged in to the Kaiku Health -service were placed around the space. Each group was assigned to one of these devices. There were a couple of reasons for doing the interactive part in groups. Often the spaces available for these kinds of training sessions are not equipped with digital devices that can be used with the service, as was the case with this training. In these situations, each participant having an own spot with the service enabled is infeasible. Therefore having Kaiku

Health Ltd. employees provide the devices is a more viable scenario. As a rule of thumb, Kaiku Health Ltd. aims to have at least two employees present in a training. If each employee takes a laptop and a tablet with them, two employees are enough to provide a training for 8–12 people, with group sizes of 2–3 participants. Considering that software company employees usually have a work laptop and that the expense from acquiring a few tablets for demonstration purposes is reasonable, this can be seen as a realistic approach for most companies. Another reason for grouping the participants is that it creates a basis for similar collaboration to happen in actual workplace situations as well. Since the staff, especially so-called "superusers", train other staff in the usage of the Kaiku Health -service and in new technologies in general (Peres 2005), them being comfortable with working in tandem with others is desirable.

The researcher had created test accounts to the service beforehand. This was to ensure that no time would be needed for creating user accounts during the training.

Since the software separates staff users and patient users and works markedly differently for these groups, two groups were logged in as staff users and two as patient users. This had also been done before the training had started. Each spot had a sticky note illustrating which user is logged in on that device. This was done to avoid confusion when the participants were given tasks to do in the service (e.g. "Nora Nurse should send a message to Peter Patient"). To ensure everybody would try out the software from both patient and HCP perspectives, the participants were asked to change places mid-way through the interactive session. This was done to make sure everybody would try out the software from both perspectives, patient and HCP.

The tasks given to the participants were:

- HCP: Send a message to a patient
- Patients: Send a message to HCP
- HCP: Assign a form or a follow-up program for the patient to answer
- Patients: Answer the received form

- HCP: Transfer the form answer task to another staff member
- HCP: Mark the received form answer task as done

After the interactive part, the researcher showed a list of best practices for using the software. These practices were based on the interviews done before as well as prior professional knowledge of the researcher. The listed "quick wins" were as follows: setting a specific time for using Kaiku, for example 20 minutes once per day; inviting as many patients as possible to the service even if you doubt their interest; checking the patient's information from Kaiku before their visit; asking for help from a colleague or the technical support of Kaiku Health when encountering a problem. These were already presented on overtime and therefore no room for discussion was left. Going through these "quick wins" concluded the on-site training.

Two weeks after the training, the participants were sent an online form (Appendix B.3). The form contained the same computer self-efficacy questionnaire as in the beginning of the training. Furthermore, the participants were asked for general feedback and a permission to extend the data collection period from two weeks to two months, one before the training and one after the training.

In addition, the researcher tried to reach out for individual participants for separate interviews to get more detailed opinions from HCPs about the workshop. Only one participant answered to these requests and for practical reasons the interview could not be arranged with them either. Hence, the changes made to the workshop were made based on observations and (both spoken and written) feedback from the first workshop.

3.2.3.2 Second training

The second training was modified based on the findings from the first training. These findings are described further in Chapter 4. The structure of the second training is outlined in Table 3.5. The training was held in a conference room on the premises of Clinic C in April 2019. The contact person at the clinic invited all

the nurses working with gynecological cancers to the training. From the 6 nurses, 3 came to the training. In addition, 1 nurse and 1 doctor from the fertility outpatient department came to the training out of general interest. The backgrounds of the trainees are outlined in Table 3.4.

Table 3.4: Background information of the trainees

Trainee	**Age**	**Gender**	**Has worked in this clinic for**	**Role**	**Kaiku use in previous month**	**General computer knowledge**
Nurse C1	30-50	F	8 years	Nurse at fertility clinic, but also maternity and gynecological outpatient clinic	4-5 times	"Good"
Nurse C2	50-70	F	20 years	Nurse at maternity and gynecological outpatient clinic	Multiple times every week	"I manage, but I'm no nerd"
Nurse C3	50-70	F	8 years	Nurse at maternity and gynecological outpatient clinic	2 times	"Good"
Nurse C4	50-70	F	8 years	Nurse at maternity and gynecological outpatient clinic	2-3 times per week	"I use them daily at home and work, no problems usually"

However, the doctor left after around 30 minutes of the training and hence their experiences are excluded from the thesis. The fertility nurse's experiences are included in the thesis, but since the fertility side is somewhat different to oncology, this will be taken into account when analyzing the findings. The average age of the participants (excluding the doctor) was 53, and all of them were women. As a note, the fertility nurse also needed to leave after around 1h15min of the training.

In addition to the aforementioned people and the researcher, an employee from Kaiku Health Ltd. was present to make field notes and help with the interactive part of the training. As for the venue, the conference room was equipped with one computer and a projector. The researcher had brought with them 2 computers and 2 tablets to be used in the interactive part of the training.

Table 3.5: Structure of the second training

Section	**Planned time**	**Used time**	**Notes**
Behavioral intention questionnaire (1/3)	5 min	5 min	-
How to introduce service to patient	10 min	5 min	Original idea was to "role play" this, was ultimately done as an informal discussion
Interactive training	60 min	60 min	One device per participant, unlike in the first training
Reflection on workshop	10 min	5 min	-
Behavioral intention questionnaire (2/3)	5 min	5 min	-
Two weeks after the training, via email: behavioral intention questionnaire (3/3); asking for general feedback	-	-	-

The second training was started with a permission form and a questionnaire about behavioral intention, with the questions adapted from the original questionnaire by Venkatesh et al. (2003). These are displayed in Appendix C. However, the approach taken by Venkatesh et al. is quantitative. This is why the questionnaire asked for free-form text answers to explain the chosen values in the behavioral intention

questions. The aim for this was to better understand the reasoning behind these answers. In addition, the participants were asked about general experiences of using the Kaiku Health -service as well as how much they had used it in the last month. A group interview was also considered for asking about the reasonings behind the BI answers. However, it was ultimately dismissed because of how much group dynamics and hierarchy affect group interviews, as outlined by Hirsjärvi and Hurme (2008, p. 63).

After the questionnaire the participants were asked whether they had any specific hopes or wishes for the content of the training, with the idea that the content of the workshop could be changed to align with their wishes. This could have been done by email beforehand, but when talking with Kaiku Health Ltd. personnel about the idea they said that it had often been tried before but participants seldom answered the sent questionnaires. Hence, it was done verbally during the workshop.

Similarly to the first training, the patient registration process was shown at the start of the interactive part. Alongside this, the practicalities of how to actually motivate and invite a patient to the Kaiku Health -service were discussed with the participants. The idea for this was to "role play" the invite scenario through, with one participant being a HCP and the other a patient. However the participants seemed uncomfortable with this, and the method was quickly changed to a more open-ended group discussion about how people invite and should invite patients. The researcher did not give suggestions for that, instead allowing the participants to share their experiences to each other.

Apart from the patient invitation aspect, the training followed the behavior modeling training structure: first, tasks were shown on the screen and after that, the participants were to perform them interactively on the devices. At the start, 2 participants were assigned to devices with a HCP user logged in and 1 participant with a patient user. The Kaiku Health Ltd. employee role played the second patient to ensure that there is an equal amount of patient and HCP users. In contrast with the first training, this meant that the participants were not grouped by default. However, the researcher asked for them to work in groups in the sense that if a HCP user would have problems with the service, they would first ask help from

the other HCP user. Only if no solution could be found together should they ask the researcher for help.

The tasks that were modeled and then practiced are listed below:

- HCP: Assign a form or a follow-up program for the patient to answer
- Patient: Answer the received form
- HCP: Transfer the form answer task to another staff member
- HCP: Mark the received form answer task as done
- HCP: Send a message to a patient
- HCP: Edit patient information

As in the first training, when all the tasks had been performed successfully, the participants were asked to change roles. Those who had previously used a device with a HCP user were asked to use a device with a patient user, and vice versa. Then the same task practice process was repeated.

After the interactive section the participants were asked to fill a similar questionnaire to the one they filled at the start of the training. This questionnaire contained the same BI questions. While the first questionnaire asked why the participants had answered the way they did, this one also asked them why their answers had or had not changed from the first questionnaire. The aim was to understand why they felt like their behavior intention had or had not changed. In addition, general feedback about what worked well and what needed improvement in the training itself was asked. This concluded the on-site training. The fertility nurse received this questionnaire in digital form via email due to them having to leave early from the training. Directly after the training, the researcher and the Kaiku Health Ltd. employee had a debriefing session one-on-one, where they went through the field notes they had made in the training as well as wrote their observations down for further analysis. Field notes in general were selected because they are a common way to record key things in field research (Gibbs 2018). Moreover, the guidelines posed by Gibbs were followed in that the notes were made on the spot or immediately after, in chronological order and by trying to separate description and interpretation.

Two weeks after the on-site training the 4 nurses who participated were sent a third questionnaire via email, to which all of them answered. The questions were almost the same as in the second questionnaire. Once again, feelings about the changes (or lack of) in BI were inquired about. In addition, general feelings regarding the service use and the training were asked about to further understand the participants' experiences in the prior weeks.

3.3 Data analysis

The transcriptions of the interviews as well as the notes from the trainings were all analyzed using data-driven coding, also called open coding (Gibbs 2018, p. 45). To enable comparison between different facets of the empirical research, each phase was coded separately (coordinator interviews, nurse interviews, Training 1, Training 2). However, the process was relatively similar for each phase.

As mentioned by Patton (1990), "developing some manageable classification or coding scheme is the first step of analysis". Coding, Gibbs (2018) describes, is a way to make connections between different data items that, "in some sense, exemplify the same theoretical or descriptive idea". Moreover, this approach ties to the idea of grounded theory (GT) where "concepts are derived from data" (Corbin and Strauss 2008, p. 51). Corbin and Strauss describe a so-called "conceptual pyramid". In it, higher-level concepts have more abstraction and, perhaps, explanatory power but at the same time rest on a foundation of lower-level concepts, giving the researcher the detail and description lacking in the more abstract concepts. In grounded theory, these concepts are only related to existing theory in a later phase of the analysis, as summarized by Gibbs (2018). In practice, the process for each coding was relatively similar. Quotations or notes were assigned to codes, with new codes being made as they emerged. After all the codes had been done for the specific data, the codes were combed through to see whether there are any codes that overlap enough for them to be merged together. These were then merged together. The data was then looked through again with these new codes in mind, and quotations re-coded accordingly. Similarly, codes were renamed if it was felt that they did not

correctly describe the quotations under them.

All the codes from the different phases were then compared and made into a list where every factor was described, as well as their appearance in different phases. In this process, some of the codes were once again renamed, because different wordings had been used for the same thing in the different coding sets. Finally, these factors were categorized in two ways. First, they were categorized as either enablers or hindrances. This was not unambiguous, because many things could be counted as both. In addition, they were categorized according to larger themes they were related to, which concluded the analysis.

It should be noted that the analysis tools changed a bit throughout the study. The coordinator interviews were coded using a text editor. While this worked well, it was relatively time-consuming. For the nurse interviews, the Atlas.ti software was used to alleviate this problem. Finally, the Google Sheets spreadsheet software was used for analyzing the two trainings. The notes of the trainings were gathered to a spreadsheet to begin with, and as the software was functional enough, the researcher did not see any reason to change it.

Chapter 4

Results

This chapter presents the results of the study by looking at the different phases of the empirical research (coordinator interviews, nurse interviews, 2 trainings) separately and then answering the first two research questions. The third research question is answered in Chapter 5. First, coordinator interviews and their findings are presented by describing the found themes, after which the same is done for the nurse interviews. Each training is then presented similarly by describing found themes. However, in addition the action taken between the trainings is outlined. To conclude, the factors that enable and hinder nurses' behavioral intention are presented.

4.1 Coordinator interviews

The interviews of the 3 coordinators were coded into 25 different codes, each code having 1–27 quotations. The exact amount of quotations for each code, as well as the amount of interviewees and who the interviewees were are further detailed in Appendix D. All findings are described below, after which each is expanded upon in a separate section:

- Nurses are not involved in implementation process, even though it would probably be beneficial.
- The software provider should leverage their experience more and be more open about pros and cons.

- Nurses are (rightfully) concerned about workload and do not have enough compensated time for learning the system.
- Superiors not using the software affects nurse motivation.
- Changes in nurse-patient relationship causes worries, but also has potential benefits.
- Patient feelings mediate nurses' software usage.

Nurses are not involved in implementation process, even though it would probably be beneficial. All of the coordinators talked about a so-called "traditional, non-engaging model" for implementing new technological solutions in hospitals. In it, the implementation process is from start to finish between the doctors, other higher-ups, and the software provider. The nurses are not given a voice in this process and, as mentioned by SP2, "nobody explains why [the software] is acquired nor what the internal goals and hopes are". Having hand-picked superusers involved in the process would serve as an example to others, increase their commitment to the software and make the software more fit for their work. In practice, they could join meetings and demos, even influence the software provider selection, though P1 was wary of this. Both SP2 and P1 felt that doctors appreciate nurses a lot and for that reason nurses would probably be allowed to join the process if it just was suggested. The assumption of nurses being too busy and the fear of offending clinic management were proposed as potential barriers, neither of which were felt to reflect reality. P1, however, did point out that in the case a supervisor (e.g. a lead nurse) would want to jeopardize the process, they probably would succeed in that. On the other hand, enthusiastic superiors could inspire nurses to participate in the process.

The software provider should leverage their experience more and be more open about pros and cons. Besides bringing the nurse expertise along earlier, it was pointed out by P1 that the software provider "should have a more active role early in the process". Considering, P1 continued, that the software provider has "both experience and opinions" about implementations, those should be voiced out as well as possible. P1's view was that this would also include "being honest about the negative factors and challenges" of the implementation, emphasizing the role of understanding: "we understand that you do outpatient

work, that you are short on time and that you do not always have time to answer the calls". On the other hand, especially if the sales process is still ongoing, "nobody will say out loud that at first this will take more of your time and increase your workload", SP2 noted. "For the future this is not sustainable — and then we wonder why there are no clients", SP2 continues. Somewhat supporting SP2's argument, SP1 mentioned: "it should be proactively suggested already in the sales phase if the clinic could resource time for implementation — effects on cost as the justification".

Nurses are (rightfully) concerned about workload and do not have enough compensated time for learning the system. The time available for trainings is usually 1 hour, and even "one hour with everybody present for the whole time is a luxury" (SP2). A time of 2–3 hours was proposed as adequate but would require a decision from the higher-ups to not accept patients during that time (SP1). SP1 mentioned the lack of "standardized models" and insufficient demand by the software provider as problematic. P1 suggested an alternative training format: informal 20–30 minute information sessions that have been informed about months before. Besides training, workload creates issues. Nurses worry that the service is a "chat" where the are expected to be contactable 24/7, which is not true (SP2). They also fear that the service increases workload, and especially at the start it probably does (SP1, SP2). The Finnish law creates a scenario where nurses have to fill the same information to two services at once (SP1, SP2), in addition to which the service does not support seeing all essential patient information at once (SP2). Then again, the system often decreases the amount of call-based workload, unless a callback system is in place at the clinic. In general, it was not reducing but organizing workload that was seen as the service's biggest benefit: it helped in managing the inbound contacts and facilitated administrative patient work (SP1, SP2). Besides, SP2 outlined, if everything in the filled questionnaire is alright, the process is simple and does not require much time: a form is sent, the patient fills it, the nurse checks it, everything is OK — "and that is it", concluded SP2.

Superiors not using the software affects nurse motivation. The scarcity of available time ties to the division of work at the clinic. P1 mentioned that often nurses are afraid that doctors' responsibilities will become a part of nurses'

work. Optimally, SP1 said, "everyone from nurses to oncologists would be using Kaiku data in patient work" at the clinic. Similarly, SP2 posited peer support as an important factor. SP2 also mentioned that for some reason doctors do not use the service which leads to "nurses not getting motivated" to use the service. Continuing this: "even if only some doctors would use the service, it would be positive". As mentioned by all the interviewees, the internal processes at clinics are however often unclear: who should use the service (SP1, SP2)? How should it be used (SP1)? Why is the new software even used (P1)?

Changes in nurse-patient relationship causes worries, but also has potential benefits. This topic surfacing is perhaps unsurprising — P1 mentioned that "the job of [nurses] is to meet people". For the same reason, P1 continues, nurses often fear that they will "be left alone with no support" and "digi feels cold and foreign" to them. SP1 and SP2 had a more positive perspective on this: if HCPs already know the symptom development of the patient and do not need to use time for that, the face-to-face interactions will actually be of better quality. This is further supported by the patient themselves being more informed because of the Kaiku Health -service (SP1, SP2). When the patient knows what the nurse is interested in, they know what to talk about on the visit to the clinic. In an optimal real-life scenario, SP2 described, "when the patient arrives, a plan on how to proceed would already have been created with the doctor". An efficient workflow might also be related to the workload: both SP1 and SP2 pointed out that informed patients make less "unnecessary calls".

Patient feelings mediate nurses' software usage. The social nature of a nurse's job also surfaced in how the role of the patients was talked about. The amount of patients, SP1 felt, would be a watershed moment in a nurse's experiences: when there are a few patients, the value of the Kaiku Health -service is hard to see while with a larger amount of patients it becomes more apparent. SP2 felt that such a watershed moment might exist, but that it actually probably happens "when the first positive feedback is received from the patient". SP2 thought that the service gives patients "the feeling of being cared for", ensuring that "somebody always knows how you are doing even if they are not right beside you". The effects of the patients feeling trusting, SP2 says, is that "everything just becomes a bit

easier, even if there were some problems in the actual treatment". The patients' views were also considered when inviting patients to the service. Both SP2 and P1 said that nurses often worry that because their patients are so old they probably do not want to use the service and might hence not even be presented with the service.

All in all, the nurse opinions were summarized by SP2 as positive, while SP1 said that they have very varied opinions but seldom accept the system gracefully right at the start. The current implementation process, SP1 felt, was not standardized. They hoped that the implementation could be done "as from a conveyor belt — not the same way always, but with the same results". "Small differences always have an effect, in workflows and rules etc.", SP1 asserted. SP2, when asked about the current implementation, had a clearer view: first, accounts are made and a technical training is held. This training needs to be easy and usually contains around 4 things: registration, inviting patients, messages, "perhaps forms". Pre-training tasks via email have been tried but they have not worked well. SP2 also described the difference between a successful implementation and an unsuccessful one in their interview. In the successful implementation SP2 felt that the salespeople had described the service well and that both the users and the supervisors were excited about the service. In the unsuccessful one nobody was excited and the context the clinic worked in did not mesh with the service.

Some changes were done to the interview structure based on these findings. These changes are listed below:

- Implementation was said to be often very management-driven, with nurses being less involved than optimal. Questions were added regarding who decided to take the service into use and when nurses had found out about the implementation.
- Workplace culture was mentioned as a factor, so asking about colleague feelings was added.
- Pre-use fears were mentioned as potential hindrances. Since the nurses had already used the service, these fears and whether they had been realized were asked about.

- Support by superiors was mentioned as a potential enabler. Whether nurses had received from support and from whom was added to be asked.
- It was proposed that feelings change over time. This was asked about as well as what had changed and why.

4.2 Nurse interviews

The interviews of the 3 nurses were coded into 49 different codes, each code having 1–13 quotations. The exact amount of quotations for each code as well as the amount of interviewees and who the interviewees were are further detailed in Appendix D. All findings are listed below, after which each shall be expanded upon.

- Use centered around few persons, which works adequately but creates fears for the future.
- Doctors using the service was seen as essential, but their training procedure is unclear.
- The service can increase workload, but integrations and time management help with this.
- Early involvement in implementation was seen as positive, but lack of involvement not necessarily as negative.
- Information flows well inside team and with the software provider, but less so inside the whole clinic.
- No extra support from superiors is needed, but peer learning is important.
- The service makes face-to-face meetings more personal and reveals unexpected urgent changes in patient well-being.
- The service has not changed daily workflow much.

Use centered around few persons, which works adequately but creates fears for the future. Nurse A1 was the main user at Clinic A and described their 3 colleagues as follows: ”one does not care too much for Kaiku, one does their best to keep along, and about the third one I am not so sure what they actually do”.

Clinic B was similar, with Nurses B1 and B2 being the main users. Both Nurse B1 and Nurse B2 mentioned that the situation emerged automatically, because they specialize in hematology and as such "know the patients" (Nurse B2). "Not everybody needs to be along", Nurse B2 commented. At the same time, the people who happened to be in the first training got the credentials to the service (Nurse B1), and in the start "it was not so clear" how the work would be divided (Nurse B2). No explicit information had been distributed on the service being on, with Nurse A1 and Nurse B2 just telling others that "here is a tool, go with that" (Nurse A1). Nurse B1 and Nurse B2 were content with the current situation since they had so few patients. However, they did not see any benefits in having so few nurses use the service. Moreover, the growing amount of patient created fears: "it depends on how prevalent it will become, whether it comes to all hematological patients — if it would, then the amount [of patients] would be immense". Some reasons were proposed regarding why others do not use the service: Nurse A1 mentioned lack of use experiences with the system and computers in general as well as a scepticism towards all digital tools. At Clinic B, the general feelings of the colleagues of Nurse B1 and Nurse B2 were described as being both "for and against" the service.

Doctors using the service was seen as essential, but their training procedure is unclear. As described by Nurse B1: "The service is very good, if you do not know the answer but it's something the doctor knows, you just pass it on to the doctor using Kaiku". On the prospect of a doctor not using the service at all, Nurse B2 commented: "It would be a bit bad for us to use the service if the doctor does not use it, because some things have to be forwarded to them for further handling. I guess it could work in theory, you could then call and ask, but it is so much easier to just pass on the problem to the doctor straight through Kaiku". The hypothetical posed by Nurse B2 was an unfortunate reality for Nurse A1: "The doctors do not really use it. One knows how to open it. Another that does not anymore work here used it actively". Currently Nurse A1 printed form answers to doctors, saying that "of course it is easier if the doctor opens [the service] and looks at the form". Reflecting on the implementation, Nurse A1 commented: "Doctors have hoped that this kind of a software will be taken into use, but they themselves have zero interest — where is the problem?". Answering this, Nurse A1 said that a fear of computers and not knowing how to use the service are problems. On

the latter, they offered an example where after a long absence a doctor claimed having done all required tasks. However, they had not marked them as done and so Nurse A1 had dozens of unread notifications they had to check through just to be sure. Then again, a new doctor was coming to do work at both clinics A and B, but none of the interviewed nurses knew when the doctor would be trained and by whom.

Service can increase workload, but integrations and time management help with this. Nurse A1 described the service as a 'double-edged sword': "in a way, it decreases [the amount of work], but it can also increase it. And when it increases, it feels like shit". Nurse B1 feared this increase in workload at first, but said that "when you realized that it is easy to learn, simple to use and does not take time from work or increase workload, the feelings have grown more positive". According to Nurse B1, this was also highlighted by the software provider at the start. Time management was also praised: "Now there is a moment to check Kaiku, so it does not pause other work, I have really liked that". Nurse B2 had a more reserved view on workload management: "now I have to write into the patient record myself that the patient has answered this to Kaiku and we have discussed that, so if I could directly put them there it would save the extra writing -- because this does take some time". Integrations could be a good addition, Nurse B2 summed it up. Nurse A1 brushed up on the topic of having to use other software saying that they "already have enough softwares, dozens of them". On the topic of integrations, Nurse A1 commented: "now that we have integrations it is very good, before integrations we did not have enough time -- might be that there [were] 45 names on the list and 2 nurses + 1 secretary, so you could not necessarily handle even 2 [patients] per day".

Even if the service helped with workload, this was sometimes hard to prove. Nurse A1 said that a medical director had deemed patient-nurse call statistics uninteresting, and their tracking had been stopped. This made justifying the time used for the Kaiku Health -service hard. "One call is quickly 10, 30, even 120 minutes of extra work. We have to somehow show why we have been working late or have not had time for something" To solve this, they began to approximate that 1 task handled by the service can be seen as 1 call less. Nurse B1 and Nurse B2

also mentioned the decrease in calls: "before, we used to have quite a lot of calls about non-urgent things, which then disturbed the daily workflow".

Early involvement in implementation was seen as positive, but lack of involvement not necessarily as negative. The service increasing the workload was easier to deal with when you were involved in the project right from the start and so also knew the benefits of the service, Nurse A1 said. Nurses A1 and B2 had been invited by a specific doctor to be part of the pilot research project and hence been there right from the start. Nurse B1 did not know who had started the project, but was content with not knowing. In general, Nurse B1 was fine with a passive role in the implementation because they knew that other nurses had already been involved. Somewhat to the contrary, Nurse A1 suspected that their colleagues' motivation might be lower because they were not involved in the implementation.

Information flows well inside team and with the software provider, but less so inside the whole clinic.. Nurses B1 and B2 were thankful they had been trained well in advance and SP2 had been proactive in calling them and asking about experiences. Communication worked well inside their team and the previous doctor had also actively told them the latest news. Contact persons regarding support with the software were clear: either SP2 ("because they came here to guide us") or the technical support of Kaiku Health Ltd. (Nurse B1, Nurse B2). As an aside, Nurse B2 mentioned that they actually had a problem for which they had not asked help because they had a way to circumvent it. Communication inside the whole clinic did not go as swimmingly, with all interviewed nurses criticizing it. Nurse A1: "line workers will not be told anything about schedules, at earliest things will be told 3 weeks beforehand, when you need to inform where people will be working". This also made it hard to involve nurses in the implementation, because you could not know who would be available when the time came.

No extra support from superiors is needed, but peer learning is important. In general the nurses did not need any extra support from their superiors — the software "is anyhow just one small part of this work" (Nurse B2). The importance of peers, however, was highlighted. Nurse A1 had had a few meetings

where the service was learned together: "we went through together how it would be used, [there were] also those coming to the outpatient clinic -- it has been pretty good, a bit of rehearsing and motivation". However, they would have liked to have more time for learning the software with peers. Nurse B2 also talked about peer support, saying that they have discussed and asked questions from Nurse A1 over the phone. "Nurse A1 was part of the pilot also, so it has been natural to ask them then". Besides, nurses train other nurses to use the service at Clinic A. Nurse A1 commented: "all new nurses I have oriented -- they are old stagers but not in outpatient work — the inpatient work is a totally different thing". On the new nurses' knowledge of the Kaiku Health -service beforehand: "they do know what it is, and maybe even have opened it before". At Clinic B, training new employees seemed to be a hypothetical issue. Nurse B1 commented: "Probably Nurse B2 would be responsible, they have been already in the testing phase". While trainings were treated relatively positively, Nurse A1 also mentioned a manual they received in the beginning: "an over 20-page guide on 'this is how Kaiku works' is not very alluring".

Service makes face-to-face meetings more personal and reveals unexpected urgencies. The service changed the nature of the nurse-patient relationship. More trust was needed in patients actually calling about urgencies. Then again, patients sometimes hesitated in telling about symptoms during the appointments, which they did not do when filling forms at home (Nurse A1). Besides, not having to fill forms during the appointment left more time to be present with the patient. Nurse A1: "the parking spaces are awful, the doctor's appointment is 20 minutes — the time can be used for running in the parking area and taking the blood pressure (medical treatment can lower it), instead of filling a form (during which you cannot take the blood pressure) since it is already on the computer". Moreover, both Nurse A1 and Nurse B2 highlighted how the service gives a better overview of the patient's health, revealing urgencies that the patient does not realize are urgent.

The service has not changed daily workflow much. This was partially because many patients still want to use paper forms. One reason for this is patient age: "our patients are 70 years old in average, which reduces the amount of users".

Nurse B1 said that "I do not see any problem with this, except maybe that archiving of information is more difficult". As a somewhat contradictory statement, Nurse B1 also mentioned that "it's a challenge that not every [patient] uses [the software]". As far as workflow goes, Nurse B1 appreciated the service sending reminders to email, "I do not need to remember these myself". This was a fear of Nurse B1 at the start, but not anymore. All the nurses try to check the service once or twice a day, but Nurse A1 mentioned that there is not always enough time to do that. They did not see this as that big of a problem, saying that "it is good that you do not need to be checking it all the time -- there should be nothing urgent there". The patients' answers are viewed together with the doctor when the patient comes, and the answers will often be relayed to the doctor using the service (Nurse B2). At Clinic B, said Nurse B2, there is an unofficial agreement that if a nurse has handled some certain patients' messages before, the same nurse will handle it in the future as well, unless it is an urgent thing. Nurse B2 said that they do not relay the tasks to other nurses by using the service.

4.3 Training 1

The notes from Training 1 were coded into 7 different codes, each code having 2–13 notes. "Notes" here comprise of field notes and direct quotations from the trainees, either from the training itself or from the questionnaires. The exact amount of notes for each code is further detailed in Appendix E.

Unsurprisingly, most of the notes regarding the first training concern the training itself and how it was done. In general, the trainees regarded the training as OK, commenting: "generally a positive atmosphere", "the workshop succeeded well", "the workshop was well built from the angle that everyone knows the basics of Kaiku". The only explicit negative concerned the mismatch between content and title: one trainee felt that "the content did not match the title / expectations". The title had been "Group exercise of the nurses — The rules of using Kaiku", and it had been sent to the trainees long before the content had been finalized.

The training started with an exercise about the positives and negatives of the Kaiku Health -service in use. Here, trainees were asked to find unfamiliar faces to do the exercise with: this seemed to work relatively well, with the trainees ending up with people that were not from the same clinic. The trainees found many pros and cons regarding the service, and as such the exercise was a good warm-up for the training. However, it took quite a lot of time, and considering that the training started 30 minutes late, perhaps too much. After the sticky notes had been collected and placed on the wall, the researcher asked for free-form comments, going through each note one-by-one. The situation was not very natural and the same few people mostly commented on the issues. Some discussion did arise but to further encourage it this was changed to be more informal, more conversational and shorter in the second training. The actual pros and cons found in the exercise are looked at at the end of this section.

The training continued with the researcher showing the patient registration process as screenshots on the whiteboard. When asked, the trainees commented that they had never seen this before. In the general feedback from the training, one trainee commented: "seeing the patient side gave me more knowledge on how to guide [the patient]". This comment referred probably both to showing the screenshots and actually using the patient side during the interactive part of the training.

For the interactive training, test accounts had been created beforehand. This proved itself as a sound decision, since creating the test accounts took approximately an hour. This can be partially attributed to the researcher's lack of experience with the task. However, it shows that creating the accounts on the spot is not a strategy fit for less experienced employees (e.g. new ones) and therefore should probably be avoided. Another practical consideration was that the names and roles of the "fictional persons" each device was logged in as were written on a sticky note. This seemed to be a surprisingly important detail. At first, the participants were very confused about who they were using the service "as". After being made aware of the sticky notes and their role, the participants used them multiple times throughout the workshop. This also avoided confusion when the participants were asked to change places mid-way through the interactive session.

When using a HCP profile, the first two tasks (sending messages and transferring tasks) seemed to be relatively easy for the participants. This was despite the fact that Clinic B participants did not use that feature in their own work because they had agreed on having dedicated patients for each staff member, instead of passing tasks around. These participants did give positive feedback about learning this feature even though their current workflow did not require it. The third task, assigning tasks to patients, proved more challenging. Participants looked for the feature in places it cannot be found from and got stuck before a Kaiku Health Ltd employee helped them forwards. This goes to illustrate the importance of the modeling part in behavior modeling training, which was left out from this training. Based on these experiences a decision was made to ensure its presence in the second training session. When using a patient profile none of the tasks posed any difficulty to the participants. This in spite of the fact that none of them had even seen the patient profile interface before. This is probably because the patient interface is noticeably simpler than the HCP interface and so the relevant things were easy to find. Despite this, they appreciated this part and as such using the patient view was included also in the second training. In general trainees gave feedback that "with the different tasks you learned to use the program in a more versatile way". Another trainee commented that "specifically assigning the tasks was good". "The usage training was good", mentioned one trainee.

To conclude the training, quick wins for the use of the service were presented by the researcher. This was received lukewarmly at best and many of the things seemed either elementary, or even incongruous with the trainees' own experiences. One nurse noted that the mentioned time of "20 minutes of using the service per day" is closer to 2 minutes in reality, noting that their workload was not increased that much by the service. While the quick wins -section was left out from the second training, it could work if done in a more trainee-led manner.

When analyzing the pros and cons of the service at the start of the training, multiple subjects popped up. Workload was one — a trainee feared whether nurses would actually have enough time to use the service. Another was worried about the fact that the patient does not see whether their task has been handled and so the HCP needs to inform them manually. On the other hand, one nurse commented as a

counterpoint that "actually the service makes the care process faster, because you can check the patient's symptoms already before the appointment". Being able to follow the patient's symptoms from a longer time period also was appreciated. Somewhat related to the workload, the trainees also mentioned the social context of the software. "Will the whole care team commit to using the software, both nurses and doctors?", they proposed as a potential challenge in using the software.

The Kaiku Health -service's role in the communication with the patient was also dug into. It was felt that the service enables better care for the patient because the staff is more easily reachable and information flows both better and in the right time, without having to wait for the appointment. On the other hand, engaging the patients was seen as difficult. Specifically, the attitudes of older people towards this kind of digital service were talked about — do they see it as more negative? One trainee pointed out that the patients still do have the possibility for "regular support over phone" so nobody is "forced" to use the service, but "at least they should be actively offered the option". Related to this, one trainee suggested in the feedback that the training should focus more on "the conversation between the patient and the nurse". This was requested despite the fact that during the same day, there was a separate workshop about that exact topic, organized by the pharmaceutical company. Therefore, it seemed like the need for that was strong. As a reaction, the communication between patient and nurse was taken to be a part of the second training.

In addition, some specific features of the software were commented on, namely that "inactive" patients should be taken away from the list of patients, and that email reminders for patients should come a bit later than at 6AM in the morning, since patients often have notifications on and hence wake up to this.

4.4 Training 2

The notes from Training 2 were coded into 7 different codes, each code having 4–26 notes. Here, too, "notes" comprise of field notes and direct quotations from

the trainees, either from the training itself or from the questionnaires. The exact amount of notes for each code is further detailed in Appendix E.

The second training, too, started a bit late. The conference room was locked and the trainers were able to get into the space only exactly when the training was supposed to start. This, though, could have been avoided by the researcher being a bit more proactive in contacting the contact person. However, the trainees were not right on time either, giving the trainers time to set up the training.

The training was started by asking whether the trainees had any wishes or hopes for the training's content. None were given. However, in survey 2 different trainees commented that they would have wished for a "pre-training questionnaire" to be sent to customize the content to their liking, assuring that they most likely would have answered that. Leaving that out was a conscious decision on behalf of the researcher, because as mentioned by SP2 in the coordinator interviews, it had not worked before. Still, perhaps it could be done for safe measure considering the relatively low effort needed for it. While the trainees did not explicitly request any specific content for the training, one trainee asked about how to make clients inactive in the service. This was hence included in the BMT part of the training later.

After asking for the trainees' wishes, an informal discussion about experiences of the service was held. While the takeaways from this were perhaps more disorganized than in the exercise of the first workshop, the atmosphere was more natural and with the small group size worked well. The idea was that this would be followed by a part where the trainees would work in pairs, acting out the scenario where they invite the patient to the service, and that this would then be analyzed together. The trainees did not seem very receptive to this idea. This was potentially reinforced by the space being small enough to not allow privacy, the acting element, and the small group size. It was then quickly changed to more of a discussion session about the topic, a measure that SP2 (the other Kaiku Health Ltd. employee) described as working well. The views of the nurses regarding the service in use as well as the invitation process are looked into later in this section, after having gone through the practicalities of the training. The discussions were followed by the

researcher displaying the patient registration process similarly to the first training, as screenshots. Once again, the trainees had not seen this part of the service and were appreciative.

Unlike in the first training, the interactive part was begun by modeling the tasks that would then be done interactively. For each task, the researcher asked whether the functionality was known to the trainees already. While most seemed to be familiar, one trainee shyly said that it would probably be good to go through the tasks, just in case. It seemed that if the group pressure had been higher, it might be that this nurse would not have dared to say this out loud at all. Besides, while the tasks were basic and something that the trainees "would already know", this was not necessarily the case in practice. This view was further strengthened when some trainees who seemed confident in their skills with the tasks struggled to actually replicate some of them when actually working with the service. Then again, in survey 3 many considered using the Kaiku Health -service as "easy".

The interactive part differed in execution a little compared to the first training. There was one device per trainee, which meant that every trainee was always doing the tasks themselves. In a way this worked well, giving each trainee a more hands-on approach than in the first training where the amount of hands-on work depended a bit on group dynamics as well. On the other hand, while the trainees were encouraged to ask for help first from their colleagues and only then from the trainers, this did not happen. While in Training 1 the problems were discussed a lot with the pair/group you were working with, here most questions were asked from the trainers straight away. Some of the tasks did pose some challenges. Deleting a program from a patient, finding where to add a task to a patient and finding where to edit information all caused difficulties. Sending messages as HCP and patient posed no problems, same for answering forms as a patient. SP2 mentioned that when the audience is not very playful, as was the case now, having clearly structured tasks like this works well. With more playful crowds, then again, the structure does not need to be as rigid, SP2 thought. As a practical point, some trainees had problems with their devices because they were used to different ones. The operation of a Mac laptop caused confusion, same for the use of a touchpad. The former problem was solved by SP2 explaining the functionality, the latter by

the researcher giving the external mouse of the space to the trainee. The whole training session was concluded with a feedback questionnaire (survey 2).

Generally, the reactions of the trainees were not very strong one way or the other. One trainee commented, that the training was "pretty OK", with other comments describing the training as "generally good" or "good". The interactive session received mixed feedback. "In the training it was excellent, that you could 'do things yourself'", commented one trainee. This was echoed by two other comments: "Practicing was nice, and you got some confidence in using [the software]"; "repetition is the mother of learning, of course, so in that sense it was a good training". Others did not view it as positively: "Because Kaiku has been in use, the topics were familiar. The training fits well for those who are taking Kaiku into use as a new service. I would have liked to have this training earlier, already before taking the software into use". Indeed, the low amount of training before this training was criticized, and 2/3 of the oncology nurses present had not received any training before. Trainings had been given before, so the reasons for this might have related to scheduling issues or similar.

When talking about the service in use, the timetables of the HCPs were brought up. "We have a lot of part-time and substitute workers, who then also need to use Kaiku". While physically the HCPs at Clinic C work in the same place, their use of the Kaiku Health -service depends entirely on their shifts. The social context around the use of the service shapes the usage: "first Kaiku is used, then your workstation changes and it might be that I do not touch Kaiku in 2 months". Moreover, when asked about whether the training had changed the trainees' intention to use the service, the answer was resoundingly negative. Each trainee said that they use the service when they have a shift and since it is required as part of their job duties, the training did not really affect that. Similarly, in survey 3, some mentioned going on vacation as a reason to not use the service.

In daily use, the role of the patients mediated a lot of the nurses' use of the software. Regarding the inviting of the patients to the software: "Do patients even want to be involved with their illness outside the clinic — if they do not even want to think about the illness? We usually say that you do not have to respond [to the invite],

and many then keep thinking — you can then invite them and they either accept or reject the invite", one trainee commented. They continued that everybody is asked about the software, unless they have already rejected some other similar service. The fertility nurse regarded inviting as easier, but the context of fertility patients being young and more comfortable with digital technologies seemed to explain that. The patients of the oncology nurses were older. However, to this one trainee said: "surprising people have taken Kaiku into use, you cannot guess that based on outer appearance", and others agreed. "Logging symptoms is important" was outlined as one factor the nurses used for motivating the patient to use the software.

Why the amount of patients in medical care was seemingly low at Clinic C also came up in two reasons. First, elsewhere the service had been regarded mostly as a follow-up thing, shaping the opinions. Second, from a purely technical viewpoint one trainee said that they had not noticed that there is a custom program for medical care patients in the program. Concerning the content, one trainee criticized that all contents had not been set up in the software when it was taken into use. SP2 noted that this was a known problem that was being fixed at the moment.

There were some problems regarding the daily use. Many report things in the service that do not relate to the specific illness being treated at the clinic, commented one trainee. Another replied, however, that the forms do contain the part where the patient can comment on this specific thing. Besides, in survey 3 a trainee commented that maybe the symptoms cannot even be separated between different illnesses, if a person is considered as a psychological, physical and social whole. One also lamented always "having to call and ask the patient". On the other hand, another trainee said that "many do not tell about their symptoms on the doctor's visit, but in Kaiku they do".

Regarding the social context and the division of work at the clinic, some comments arose. The training of new employees was perceived as working well. The new employees "are ready to study and use the system". This readiness would then be utilized: "the information does flow between nurses -- the working pair trains the new employee to use Kaiku and if not them, then some third person will -- this

does work pretty well". Besides, one trainee said, it felt like "everybody had taken Kaiku into use as their own tool and that it is an important part of the work". The trainees also commented that "tasks will usually be forwarded to the doctor in case needed". When inquired about how this happens, the trainees told that they will remind the doctor to check the service — without reminding, doctors did not use the service.

In addition, some specific feature-related things were mentioned, namely that the slider when answering about pain levels is difficult to use on a phone and that the symptom comparison view only supports a few forms at once. The technical support of Kaiku Health Ltd. also received praise for answering quickly and professionally.

4.5 Factors that enable or hinder the behavioral intention of nurses

This section combines the findings of the four empirical contexts: the coordinator interviews (SP1, SP2), the nurse interviews (Nurse A1, Nurse B1, Nurse B2), and the two trainings (clinics A and B, Clinic C). This section aims to answer the research question RQ1 and RQ2, outlining the different enablers and hindrances of nurses' behavioral intention to use a digital service. These factors have been categorized into 6 different themes.

4.5.1 Clinic's internal processes

Table 4.1: Enablers and hindrances related to the internal processes of the clinic

	C	N	T1	T2
Enablers				
Checking the service every day		3		
Involving nurses already in the requirement phase	3	1		
Nurses training other nurses in service usage		3		X
Peer support	1	3		X
Support of superiors in the form of resources (e.g. time)	3	1		
Training of doctors		2		
				X
Hindrances				
Clinic management do not know how service use would happen in practice	1			
Cyclic work, where big pauses in using the software might happen		1		X
Internal processes unclear	3	3		X
Management decides that service will be taken into use, nurses are not asked	3	2		
Not committing new employees to service usage	1			
Nurses cannot justify time used for service to superiors		2		

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

Many factors that came up in the data concerned the workflows inside the clinic (see Table 4.1). The "superuser" nurses did not necessarily spend a lot of time using the service, but they had a habit of checking the service daily, sometimes multiple times during the day. On the other hand, their colleagues who were not

as comfortable with the system did not use the system as often, sometimes using it only when they needed be substitutes for the "superusers". Besides, the decisions on who uses the software to begin with were sometimes based on volatile factors such as "who happened to come to the first training". Considering that from the 3 oncology nurses attending the second training only 1 had been in a training before, this is a relatively haphazard decision-making process that might hinder the usage of the software. The processes regarding the use of the software were unclear in general: is the service for follow-up patients only or for other patients as well? If there are new employees, be they doctors or nurses, who will train them? At Clinic C the pair-based workflow had shaped the training of new employees, with the working pair being the default trainer for the new employee. At Clinic A, every new employee was trained by the superuser and at Clinic B, it was still unclear. Moreover, the training of doctors had no clear model at all. These all tie to the fact mentioned in the coordinator interviews that clinic management often does not know how the service would be used in practice. Sometimes, as brought up by Nurse A1 in the nurse interviews, the nurses even had problems justifying the time used for the service to their superiors. To this hindrance, the counterpoint would be to enable the nurse by giving their support — not only verbally, but also in the form of resources such as time, as came up both in SP1 and Nurse A1's interviews. More specifically, at Clinic A more peer support would have been needed for learning the software together with other nurses. Clinic C's working pair model also seemed to, at least partially, answer to this — peer learning was part of the workflow almost by default. Often the nature of how shifts were assigned at the clinic also hindered the use of the service. All clinics had cyclical work processes, where the nurses sometimes did not use the service for a certain time period, sometimes even multiple months. This made the return to using the software sluggish and hindered the nurses' use. It should be noted that this did not come up in the coordinator interviews at all.

4.5.2 Division of work

Table 4.2: Enablers and hindrances related to the division of work

	C	N	T1	T2
Enablers				
Clear who uses service and who does not, and who will replace in case of sickness		2		
Doctors using service actively		2	X	
Every nurse using service			X	X
Everybody knowing at least cursorily how to use the software		2		
Having superusers	3	1		
Knowing who trains new employees				X
Only handling patient cases of "your" patients		2		
Hindrances				
Doctors do not use service	2	2	X	
Not knowing who trains new employees		2		

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

The division of work inside the clinic is an internal process that warrants particular attention, and the factors related to it are shown in Table 4.2. The most obvious takeaways regarding this pertain to how the doctors used the service. Indeed, it seems that each of the clinics had their own model. Starting from the most *laissez-faire* approach, at Clinic A doctors by and large did not use the service to an extent that it would have benefited the nurses. This increased the nurses' workload, according to Nurse A1, and as such hindered their use of the service. At

Clinic C, doctors used the service "on-demand", but their use depended on the nurses reminding them to actually check the service. While the use was seen as a positive factor, reminding the doctors brought additional work to the nurses. At Clinic B, doctor use had integrated well into the daily work at the clinic. Nurses routinely forwarded tasks to the doctors using the service itself, and doctors then checked and handled the cases when needed. Clinic B nurses praised this, saying that it is hard to imagine how using the service would work if doctors did not use it as well. In this light, the more the doctors used the service, the more it enabled nurses' usage of the service. Conversely, doctors not using the service increased the nurses' workload and hindered their usage of the service.

Having more proficient users — superusers — of the Kaiku Health -software was seen as an enabler for using the service. Superusers relayed news about the service to other nurses, collaborated with each other (even between clinics) and served as the immediate context for asking for help with the service. However, other nurses having at least cursory knowledge of the service was also an enabler: if the superusers got ill or were otherwise unavailable, other users should be able to substitute the superusers without much hassle. It should also be known who will handle this, or at least there should be a trust that somebody will handle the cases.

As an additional enabler at Clinic B, the nurses had "assigned patients", and only handled other nurses' patients' cases if there was an urgency. While this workflow was not in use at the other clinics, it made the workflows at Clinic B clearer according to the interviewed nurses.

4.5.3 Features of the Kaiku Health -service

Table 4.3: Enablers and hindrances related to the features of the software

	C	N	T1	T2
Enablers				
Integration with existing patient system		3		
Service is easy to use		1		
Knowing how the patient side works			X	X
Reminders help: do not need to remember to check service		1		
				X
Hindrances				
Needing to log in always		1		
Not being able to see next day's patients			X	
Not having one view for all the relevant information	1	1		
Reminders clog the HCP emails			X	
Unfamiliar features		1		

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

Some enablers and hindrances related to how well the software's features fit the nurses' workflow, summarized in Table 4.3. Each interviewed nurse mentioned the overhead caused by needing to operate multiple systems. In particular, at Clinic B the law requiring the archival of medical records into the primary medical record system led to a situation where nurses needed to write the information from the Kaiku Health -service also to another system. To counter this the nurses would have wanted the system to integrate with the primary medical record system. At

Clinic A, Nurse A1 mentioned, the service was very unpleasant and inefficient to use before they got integrations into the existing systems at the clinic. The separate login needed for the Kaiku Health -service was also lamented, with Nurse A1 commenting that the need to always log in bothered them. Nurse A1 said that they found it hard to find all the relevant information from the system regarding a certain patient. On a larger scale, not being able to find out information about who is coming to an appointment tomorrow hindered their usage.

The service was found to be easy to use. In the trainings, the patient side proved itself especially usable, raising almost no questions. Seeing and getting to use the patient side of the service was seen as an enabler for both using the service and guiding the patients in its usage. The reminders sent by the service took some of the burden of remembering away from the nurses (Nurse B1). On the other hand, in the first training the reminders were also criticized for clogging the nurses' emails.

One hindrance was also the features, that were either unknown or incomprehensible to the nurses. Nurse B2 commented on quality of life -questionnaires, whose role they did not understand, while in Training 2 a nurse from Clinic C was surprised that there is a separate program for medical care patients.

4.5.4 Nurse-patient relationship

Table 4.4: Enablers and hindrances related to the nurse-patient -relationship

	C	**N**	**T1**	**T2**
Enablers				
Service enables seeing patient development over time	2	2	X	
Offering the option to use the software for every patient			X	X
Patient is more able to contact whenever			X	
Positive feedback from patient	1	1		
Unexpected information/urgencies are revealed by service		2		
				X
Hindrances				
Age of patients creates doubts	2	1	X	X
Face-to-face contact goes away	1			
Not being able to trust that patient will proactively call about urgencies		1		
Not knowing how to motivate the patient to use the software			1	
Patient is more able to contact whenever	1	1		
Uncertainty if patients want to deal with illness outside clinic				X

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

Multiple factors were related to the relationship and communication between the nurse and the patient, summarized in Table 4.4. Being able to see the patient development over time was mentioned in both the coordinator interviews and the nurse interviews, working as an enabler to use the service. However, being able to motivate the patient to actually use the service is not a natural part of nurse

work — nurses required help in this and had few tools to actually motivate the patient, as came up in the trainings. Hence, not knowing how to motivate the patient to use the software is a hindrance. The actual clientele also causes worries, with nurses being concerned about whether the patients are too old to actually use the software. "Do the patients even want to deal with the illness outside of doctor's appointments?", nurses wondered in Training 2. While this was seen as a hindrance, a countering enabler was found in offering the option to use the software to every patient irregardless of their age or appearance. SP2 mentioned the fear nurses have of losing the face-to-face contact with the patient hindering the intention to use, but it should be noted that this did not come up in the nurse interviews or the trainings.

The nature of connection with the patients also changed along with the software. Nurse A1 and SP2 commented that a fear of the patients being always able to contact the nurses might be a hindrance. On the other hand, in Training 1 the patient being able to constantly contact the staff was seen as a positive factor. Somewhat contrastingly, Nurse A1 was also worried about whether the patients will actually call the clinic when they need to — in this sense, the Kaiku Health -service required more trust from the nurse.

Positive feedback from the patient came up in both SP2's and Nurse A1's interviews and can be considered an enabler for the intent to use the service. In addition, the fact that the service helps in finding out unexpected information and urgencies was praised by Nurse A1 and Nurse B2 in their interviews.

4.5.5 Workload

Table 4.5: Enablers and hindrances related to the workload

	C	N	T1	T2
Enablers				
Amount of calls goes down	1	3		
High amount of patients makes value of service clearer	1		X	
Information is easier to archive with service than with paper		1		
Service gives more time for patients in face-to-face meetings		1	X	
Knowledgeable patient makes care process more efficient	2			
Menial tasks being able to be done by Kaiku (e.g. prescriptions)		1		
Time can be managed more effectively	1	1		
Hindrances				
Amount of calls does not go down	1			
Amount of existing services	2	1		
Control over own work goes away	1			
High amount of patients increases workload		2		
Low amount of patients	1	1		
Workload is increased	2	1	X	

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

The workload caused by the implementation of a new digital service came up both as fears and as actual experiences, as summarized in Table 4.5. The amount of calls decreasing was raised up as an enabler in the coordinator interviews as well as the nurse interviews. The service, indeed, had decreased the amount of calls

in the nurses' experience. SP2, though, commented that this is not always the case, especially if the clinic has promised to call back on all inquiries. Besides the calls, the ability to handle tasks like drug prescriptions through the service was lauded by Nurse A1. In general, the views on the Kaiku Health -service's effects on workload varied: Nurse A1 felt that it had increased the workload, while Nurse B1 and Nurse B2 did not share this feeling. The fear of an increasing workload was also mentioned in the first training.

On the other hand, SP2 mentioned that one hindrance might be the fear that control over a nurses' own work disappears. Some enabling factors, however, were not quite in line with this. Nurse A1 felt that the service gives more time to be face-to-face with the patients during appointments. Nurse B1 mentioned that information is easier to archive with the service and that time is easier to manage.

The effects of a high amount of patients was unclear. SP1 felt like a high amount of makes the value of the software clearer, which also came up in Training 1. Nurse A1, then again, felt that the more patients, the more work — and while this was not yet a reality at Clinic B, Nurse B1 and Nurse B2 both feared that more patients might increase their workload. Having too few patients was also mentioned as a problem both in the coordinator interviews and the nurse interviews.

4.5.6 Software provider processes

Table 4.6: Enablers and hindrances related to the software provider processes

	C	N	T1	T2
Enablers				
Being honest about pros and cons already at the start	2	1		
Keeping superusers informed (by software provider and clinic personnel)	1	3		
Software provider contacting and asking about how it is going		1		
Technical support answers quickly and professionally				X
Trainings for service usage and the time for those	3	1	X	X
Hindrances				
Lack of use experiences		1		
Nurses' connotations of social chatting platforms	1			
Software content not ready when usage starts				X
Software provider is not familiar with daily work always	1		X	
Software provider not involving nurses early in the process	2			

Numbers in coordinator and nurse interviews mark the amount of people who mentioned this topic. X in trainings means that this topic was mentioned either in the questionnaires of verbally during the training.
C = coordinator interviews
N = nurse interviews
T1 = Training 1 (for clinics A and B)
T2 = Training 2 (for clinic C)

The factors found in the data concerning the things that the software provider processes affect or can affect are summarized in Table 4.6.

The connection between the software provider and the nurses should start already right at the start. Being honest about the software's features, both negative and positive, right at the start sets realistic expectations for the users, as highlighted by SP2 and P1. Nurse A1 also mentioned that they had an easier time dealing

with the negatives of the software because they had been involved in the process right from the start. Besides, the software provider might have fears of involving the nurses right at the start (SP2), which functions as a hindrance. Besides, the software provider should ensure that they are on the same page with the nurses: if the software provider does not want the software to be thought of a chat service but the nurses do so (as SP2 said), a communication problem might be at play. The communication factor is also highlighted in the fact that Clinic B nurses positively commented on the fact that software provider employees proactively had called them asking about how it is going. One hindering factor was also that the software content was not ready when usage started.

Trainings for the use of the software and time "officially" allocated for those was also regarded as an enabling factor, as came up in all the 4 contexts. However, a hindrance might be that the software provider is not familiar enough with the work context at the clinic. This can be seen in the training content not exactly reflecting the experiences of the nurses (as seen in Training 1's mismatched "best practices"), but also in the software's features not supporting the nurses' workflows. For whatever reasons problems with use might arise, the technical support of the software provider answering quickly and professionally can be seen as an enabling factor.

In addition, the lack of use experiences was noted as a hindering factor. All nurses noted that their colleagues lack of use might relate to lack of use experiences. In addition, the hands-on trainings got feedback from giving confidence in using the system, and in them, some basic features proved challenging to the trainees.

Chapter 5

Discussion and conclusions

This study was done as a multiple case action research study comprising of an interview phase and an action phase. Its goal was to find out what factors enable (RQ1) and hinder (RQ2) the behavioral intention of nurses towards a digital service in cancer care. In addition, it aimed to describe how the software provider could support the acceptance of a digital service in cancer care (RQ3).

In this chapter, the results of the study will be discussed and its conclusions will be presented. Afterwards, the theoretical and practical implications of the study will be looked at. Then, an evaluation of the study and its limitations will be given. To conclude, directions for future research will be proposed.

5.1 Enablers

To understand the enablers of nurses' behavioral intention, findings from the 6 interviews (3 coordinators, 3 nurses) as well as the 2 trainings were gathered and categorized according to larger themes.

In general, the found enablers tended to relate to issues pertaining to how the socio-organizational context functioned. Nurses do not work in isolation and hence the actions of their colleagues and superiors affect their work as much as the software itself. Moreover, not including nurses in the implementation process not only related to their attitude, but also to the fit between software functionalities and their daily workflows. Some of the more prominent enablers in the results are outlined below. After that they are contrasted with the findings from the relevant

literature.

Early involvement of (superuser) nurses. Involving nurses already in the requirement phase has multiple benefits. Potential negative consequences of the system are not as problematic when they do not come as a surprise. Being able to affect how the system is taken into use emphasizes the feeling of importance of nurses in the process. Not all nurses do need to be part of the process, and having "superusers" might be a viable strategy. They function as the software experts inside the clinic and also keep the clinic better informed about how the process is going. Besides, by involving the nurses early in the process, they are able to suggest how the design could be better adapted to their specific context.

Superior support and usage. How the nurses' superiors perceive the system affects how the nurses view it. Superiors not using the system affects the nurses' views negatively. Moreover, in this case doctors not using the system also had negative effects on the actual work nurses do, making it more cumbersome. Besides verbal encouragement, superiors should also give nurses time for learning the system.

Integrations with existing systems. Clinics are filled with other software that nurses are required to use. The Kaiku Health -service not integrating with existing systems frustrated nurses and created extra work. It was pointed out that the change from not being integrated to being integrated drastically affected the workload created by the Kaiku Health -service. Besides, the law requires the nurses to use some systems, which is why the same information had to be written to multiple systems.

Hands-on testing with peers. Nurses should be able to test the system before taking it into use. Hands-on trainings give them that opportunity, especially if the nurses are formally given time to do them. Moreover, learning with peers was regarded as positive and something that should be done more.

Reducing effect of changes in nurse-patient relationship. Nurses are experts in handling the patient relationship. However, digital solutions like the Kaiku

Health -service change the nature of that relationship in novel ways. Reducing the effects of those changes is important. It was found that showing the patient side of the software as well as offering the software to each patient as a clinic policy could help in this.

Better workload management. Evidence and experiences of the software reducing the amount of calls and enabling the nurses to manage their time worked as enablers. Seeing patient development and symptoms over time helped them to focus more on face-to-face contact during appointments.

All of the found enablers were supported by the relevant literature to some extent. On involving nurses early in the process, Edmondson et al. (2001) outline multiple benefits: "they can -- facilitate the re-design of workflows, provide adequate training and support to users, and highlight problematic issues". Similarly, Brewster et al. (2014) highlight how service co-design improves acceptance of new systems. Using superusers was also an oft-mentioned strategy in the literature. Ward et al. (2008) describe how "organizationally successful" implementations are a lot about "identifying champions and getting the right people on board".

The importance of superior support was acknowledged by the literature. Huryk (2010) mentions the positive effect head nurses' positive attitudes had on nurses. Edmondson et al. (2001) describe how in many successful implementations, surgeons explicitly told their subordinates how critical they are in the project. While it seems doubtful that forced compliments would help, a genuine positive atmosphere seems to be useful. Interestingly, superior usage did not come up that often in the literature, though for example Edmondson et al. mention how it is important for superiors to be active participants in technology trainings. The author speculates that this might have to do with the nature of the software studied. Many studies concern for example electronic health records, the function of which is to collect patient data into a digital format. The Kaiku Health -service is by its nature more interdependent, with tasks being forwarded from HCP to another. Hence, if some end users (e.g. doctors) do not use the service, it directly affects the network of users close to them.

Integrations as enablers were talked about, usually using the term "interoperability". Kruse et al. (2016) and Cresswell and Sheikh (2013) for example describe the importance of technologies being "interoperable with existing technology in the organization". The article by Kruse et al., though, approaches it from a more policy-oriented viewpoint than this study or the review by Cresswell and Sheikh. This slant is not unsurprising because this study is mostly concerned with the nurse viewpoint.

The importance of hands-on testing often came up through the negatives, and lack of hands-on experience was described as a barrier. Brewster et al. (2014) suggest that staff training can "improve confidence; aid familiarity with the technology; improve collaborative working between patients and nurses; and assist with caseload management". The increase in confidence and familiarity were points also highlighted in this study's findings.

Interestingly, the worry of digital systems decreasing face-to-face contact with patients was more prominent in the literature than in this study. McGinn et al. (2011) on this: "nurses saw the change from a traditional intervention delivery to a model mediated by distance and technology as a challenge to their relationship with patients". In this study, the service seemingly made appointments less questionnaire-focused, giving more time for face-to-face contact. This might be related to the fact that nurses in this study already had experience of the system. Ward et al. (2008) and McGinn et al. (2011) mention the fact that mostly HCPs without experiences of the researched system expressed these kinds of negative views.

Better workload management did not come up as an enabler. The author assumes that it is possible this is because it might relatively rare for a system to make workload management better without actually reducing the workload (which was mentioned as an enabler). In addition, the discrepancy might be caused by the nurses not actually caring that much about workflow management if it does not bring workload improvements.

As for the UTAUT model, some links can be made. Integrations, the nurse-patient relationship and workload management all concern the performance expectancy, whereas hands-on testing is firmly related to effort expectancy. Superior support pertains to social influence. The early involvement of nurses is more of an organizational issue and as such does not smoothly fit into the UTAUT framework. Nevertheless, organizational issues came up both in this study and the literature review and should be looked into when implementing a technology in a healthcare context.

5.2 Hindrances

To understand the hindrances of nurses' behavioral intention, findings from the 6 interviews (3 coordinators, 3 nurses) as well as the 2 trainings were gathered and categorized according to larger themes, as was done with the enablers. These themes are outlined below, after which the findings will be compared to the findings in the relevant literature.

Incompatibility with workflow. For some nurses software usage depended entirely on where they were working during that shift. Often work was cyclic and during some cycles the service was not even supposed to be used. Breaks could be months long and as such coming back to use the service was found cumbersome. Moreover, seeing all relevant info at once (e.g. of a certain patient or the next day's patients) would have helped the nurses' daily workflow. However, the nurses felt that the service did not fulfill these needs.

Difficulties in motivating patients to use the service. Promoting digital services to a patient was not seen as an intuitive task. Nurses were uncertain on how this should be done or whether patients even wanted to deal with their illnesses outside clinic appointments. Moreover, the age of prospective patients was seen as a barrier for inviting them to the service, because it was assumed that they would not necessarily want to use digital services.

Increased workload. Fears as well as experiences of increased workloads hindered the nurses' intent to use the service. A higher amount of patients was felt to create higher amounts of work. When the amount of patients was still small, the prospect of more patients created fears of workload increasing.

Lack of use by colleagues and superiors. Other colleagues not using the service made all the work pile up on a select few. If colleague proficiency levels with the service were uncertain, it was also uncertain if anybody could substitute in case of absence. While having only a select few users sometimes worked as well, even then there were fears about what will happen if patient amount increases. Moreover, superiors not using the service increased nurses' workload and slowed down their daily work.

Uncertain, forceful implementation process. Internal processes concerning the service use were found to be unclear. The users of the service were determined based on factors such as who was able to come to the first training. Moreover, things like "how often should the service be used", "who uses the service" and "for whom is the service meant" were unclear. Furthermore, a forceful implementation process where nurses were not asked for input affected nurse views on the service.

Incompatibility with workflow came up in the literature, though not specifically referring to cyclic work or seeing essential patient data at once. Gagnon et al. (2012) highlight that this lack of compatibility could be "due to diverse reasons", mentioning that important dimensions are sometimes ignored in HIT development because healthcare is such a complex and multidimensional field. In addition, a task such as checking next day's patients is closely related to how nurses have been doing work before. In a way, the system not supporting this kind of a workflow can undoubtedly be seen as a fault in the system. However, this is still a routine formed around existing technologies, not unlike the ones Orlikowski (2000) describes. In this thesis, nurses said that their workflow had not changed much due to the Kaiku Health -service. Considering that change is required both from the software and the clinic (Berg 2001), it is not surprising that fitting old routines to new contexts creates friction.

The problem of motivating patients also is succinctly highlighted by Brewster et al. (2014). In their review they found that it has a lot to do with the nurse's confidence in using the system. Indeed, if they were not comfortable with using the system, they feared that patients could regard them as unprofessional. This "appeared to be related to a lack of training, but more importantly the changes to their role — now mediated by technology — which nurses felt altered the fundamental nature of their job". While this was mentioned during the action research process, it should have been given perhaps even more importance.

Increased workload was a mainstay in the literature, so its appearance in the study results is not surprising. Cresswell and Sheikh (2013) note that the new system should be "at least as quick" as the one preceding it. In this sense, the Kaiku Health -service is problematic. As seen in the study results, it currently does not replace the paper forms used at clinics, instead being an addition. In that sense, the dangers of increased workload might be even more pertinent with it. And as Brewster et al. (2014) note, if workload is not improved staff is less likely to engage with the system.

The lack of use by colleagues was not directly mentioned in the literature. However, the attitudes of colleagues and superiors was found to play a role in nurses' own attitudes. Then again, Edmondson et al. (2001) describes how selecting team members randomly and not including them in trainings foreshadows unsuccessful implementations. This also came up in this study, with the selection of prospective users not being very organized. In general, Cresswell and Sheikh (2013) mention, strong organizational leadership and transparency about the pros and cons of the system are essential. This is in line with the findings of this study. As Berg (2001) and Ward et al. (2008) note, IT projects cannot be anyhow planned right from the start. This might further emphasize the importance of constant and clear communication between the stakeholders.

Privacy and confidentiality were mentioned often in the literature but did not appear as much in the results of this study. Similarly, patient safety was absent in the results of this study. Considering that "patient safety concerns -- could be overcome using appropriate risk and safety assessment" (Brewster et al. 2014), it

might be that an adequate assessment has been done prior to taking the Kaiku Health -service into use and nurses therefore are not that worried about safety and privacy issues. It is also possible that the prevalence of digital tools in other trust-based contexts (e.g. banking) has reduced the role of privacy concerns compared to the time the articles were written in. In addition, Huryk (2010) mentions the factor that resistant users sometimes are concerned about "the reimbursement and legal implications of making decisions based upon a computer", also not present in this study's results. Another explanation for these absences might be the methodology, which did not emphasize these kinds of things in the interview and training structures.

Regarding the UTAUT model, hindrances related to workflow, workload and motivating patients can be seen as relating to performance expectancy. The problem of uncertain, forceful implementation has many dimensions, and while some may fit with the model, it in itself is more of an organizational issue that does not.

5.3 The software provider's actions supporting the acceptance of a new service

In this section, the factors described in Chapter 4 are analyzed from the lens of RQ3: how can the software provider support the acceptance of a new technology. First, suggested solutions will be presented, after which they will be contrasted with the relevant literature.

HCP-oriented, hands-on trainings might help, but clinic workflow can reduce their usefulness. The findings of this thesis suggest that trainings do not necessarily lead to increases in behavioral intention if there are other, more important factors mediating the use. In the trainings and interviews alike, the cyclic work process affected the nurses' usage of the service. Then again, trainings were regarded as a good way to learn more about the system, with hands-on testing providing opportunities to learn about unfamiliar features and rehearse

already-known ones. If trainings are done, some things might be beneficial to keep in mind. Discussing nurses' experiences of service usage might help the software provider to learn more of the nurses' daily work, and nurses to learn usage practices from others. Besides, the nurses' expectations and hopes for the training itself could be asked from them prior to the training — while it might be possible that they do not answer, sending the questions does not require much effort and their absence could be noted (as in Training 2). In addition, making sure that the title of the training matches the actual content of the training might be beneficial. Having hands-on exercises in the trainings was consistently regarded as a positive factor and as such could be a good practice in end user trainings. In the case of the Kaiku Health -service, also showing the patient-facing side of the software was felt to give confidence in motivating the patients to use the software.

Involving nurses early and keeping them up-to date might make them more accepting of the new software. The software provider's communications play an important role in the system's implementation at the clinic. As mentioned by Nurse A1, knowing the pros and cons of the software helped in accepting the cons later on. Involving the nurses early on in the process was seen as a positive thing. In practice, this means for example incorporating their wishes in the implementation of the software. In addition, it includes introducing the software's features and ensuring that nurses know how to use them. As seen in Training 2, not knowing about the existence of a "medical care program" had direct consequences on nurses contextualizing the software usage in a different way ("only for follow-up") than intended. Besides, when the usage starts, the software content should already be tailored the way it was intended — errors in this might frustrate nurses, as was the case at Clinic C. Moreover, keeping superusers informed about upgrades throughout the service's life cycle could be useful, because they will be the ones distributing that information further, like at clinics A and B. Similarly, confusion of a certain feature's usefulness will lead to the feature not being used, as seen at Clinic B with the quality of life -questionnaire.

Providing nurses with tools to manage and decrease their workload might help their daily work. Better time management was an important benefit of using the Kaiku Health -service. Hence, the software features could

be done in a way that supports time management — email reminders being an example of an already existing one that was regarded as positive. Integrations with existing systems was also seen as reducing workload. However, as seen at Clinic A, nurses should also be able to prove these improvements (e.g. a decrease in the amount of calls) to their superiors. While this is related to the clinic's actions, the metrics could at least be discussed in the implementation process. Additionally, the software functionalities should make sure that if the amount of patients increases, that does not reflect negatively on the nurse's workload. The nurses felt that this was not the case with the Kaiku Health -service currently. The software supporting longitudinal actions like viewing patient development over time and easier archival of information were also mentioned as benefits of the software. Hence, they could be kept in mind when developing the service. A professional and quick tech support was also found to be a good support method in software usage, but other methods such as manuals or test accounts could be considered.

Suggesting guidelines based on nurse experiences to the clinic management could make service use more effortless. In general, the daily workflows with the service varied a lot based on the nurse. At Clinic C, the use of the Kaiku Health -service was taken as an integral part of their daily work, and hence they felt that the training did not affect their behavioral intention to use the system. At Clinic C, all patients were invited to the system while at Clinic B they were not — both seemed content with their way of working, but it was one shared by all. For contrast, questions regarding who should use the service (doctors? All nurses?) were often based on circumstance, not an active decision. Having to remind doctors (Clinic C) or even print results from the service (Clinic A) caused frustration, where as at Clinic B nurses were content with doctors using the service and could not imagine another way of working. Nurses trained other nurses but no support was given for this. Superusers were content with their larger responsibility but did not want for all clinic use to rest on their shoulders. If most nurses know how to use the service (Clinic B), substitutions and vacations can be more easily arranged. It could be ensured (for example using the aforementioned hands-on trainings) that all nurses are confident enough with the service to be able to teach it to new employees, or even to doctors if the hierarchy at the clinic permits it. In a sense, all of these could be considered as best practices: doctors should use the

system, all prospective patient should be invited, all nurses should be confident enough to substitute and train others in system use. However, it seemed that more important than using a certain workflow was finding a workflow that was consciously agreed upon and based on actual work practices. These decisions are certainly decisions by the clinic, not by the software provider. However, the software provider could give experience-based tips on how to get the most out of the service, which combined with the expertise of (prospective) end-users could then be implemented as clinic-wide best practices.

Generally, the findings were in line with existing literature. Trainings were largely found to be facilitators in acceptance. Their benefits were many — they could "improve confidence; aid familiarity with the technology; improve collaborative working between patients and nurses; and assist with caseload management" (Brewster et al. 2014). Regarding health IT, however, Brewster et al. found "little detail -- in studies about the nature of training required or how best to deliver it". BMT was chosen for the interactive part of the training and as such seemed to gather positive feedback in this study also, in line with existing findings. However, in this study the effects on behavioral intention were clearly more mediated by the daily realities of cyclic work by the nurses. It does not seem surprising, then, that while nurses felt the trainings increased their confidence in the system, no change was seen in their intention to use it.

Involving nurses early in the process was similarly supported by the literature. Cresswell and Sheikh (2013) split this process roughly in two. First, key stakeholders should be able to field test early prototypes. Testing the system should happen also after it is taken into use, which should be supported by for example "proactively reducing workloads during this time period". Second, open feedback channels should be available throughout the process, a notion supported by Peute et al. (2010). Besides, in the first 6–12 months of implementation change is going to be particularly hard, with "efficiency gains -- yet to be obtained" (Ward et al. 2008). As Nurse A1 and Brewster et al. (2014) note, implementation difficulties are often easier to overcome if long-term benefits are known. Moreover, the benefits, trade-offs and time frames should be outlined to the users, Cresswell and Sheikh (2013) mention.

Workload issues were prominent in literature as well, with new services being less appealing if they did not introduce workload benefits, as described by Brewster et al. (2014). Tech support, they continue, was also found important since it "involved learning how to recognize and manage technical problems [and] contributed towards continued improvements and also maintained acceptance". Ward (2013) proposes training as an important factor, as was also posited in this study. However, they also mention "built-in education" as a factor affecting success. The Kaiku Health -service does not contain almost any built-in education, but perhaps such could be considered. Moreover, the features built for the software should in general strive to reduce nurse workload (Cresswell and Sheikh 2013). One such feature that was also supported in literature was integrations with existing systems, as mentioned both in the results of this study as well as in for example Kruse et al. (2016) and Cresswell and Sheikh (2013).

As seen in Section 2.3.2, peer attitudes and superior attitudes were both hindrances and as such, the best practice of having everyone use the system could be reasonable. While literature was concerned mostly with attitudes, in this study some nurses regarded minimal use behavior as a potential signal of negative attitudes. The reason for especially doctors not using the service could be found in the phenomenon mentioned by Cresswell and Sheikh (2013), where technologies that undermine perceived social standing are resisted by users. Perhaps the Kaiku Health -service, in treating doctors and nurses as similar users, could even inadvertently question the doctors' hierarchical position in the clinical environment? Inviting all patients was not mentioned often in the literature. However, a study by Greenhalgh et al. (2008) raises an interesting thought to entertain. In the study, patients were worried that physicians selectively inviting patients could lead to an unequal situation where patients are not invited for unscrupulous reasons.

Altogether, the more high-level issue of implementation management came up in the literature from various perspectives. The importance of strong leadership was highlighted, and for example both Cresswell and Sheikh (2013) and Brewster et al. (2014) mention the importance of strong leadership and superusers. Then again, Brewster et al. (2014) highlight how the implementation process can also reorganize roles. This is problematic considering that, as Cresswell and Sheikh (2013) mention,

technologies that interfere with values are likely to be resisted. Ward et al. (2008) also criticize the idea of a radical redesign, because it forfeits a lot of tacit knowledge in the process. Instead, they suggest utilizing the knowledge of clinical staff, who have a lot of "embedded wisdom and already present socio-technical synergies". Berg (2001) notes that user-driven processes may lose direction because of how many stakeholders there are "pushing the process into different directions", but generally supports them. These combined seem to suggest that having working practices that are co-designed with end-users but approved by management might be a valid approach. However, Berg mentions that the routines should not be set in stone. Users are bound to start using the system in ways that deviate from the original plan. These behaviors, Berg continues, should be reacted to, not dismissed or discouraged. The software provider's role in the (post-)implementation process is generally unclear in the literature. Nevertheless, reacting to deviations in use behavior seems like a natural opportunity for the software provider. Not only is the software provider able to observe service use (from system logs; with user research), but they are also able to suggest changes to the clinic based on these observations. While they undoubtedly are affected by factors such as having to maintain good customer relationships, they are not as bound by clinical hierarchy as the nurses are. Besides, "when [such reactions] are carefully nurtured and acted upon, they can help further the creation of a truly powerful [system]". Moreover, the agile processes used by software development companies (see f.ex. Beck et al. 2001) seem more fit for these kinds of behaviors than the ones used in the relatively traditional world of healthcare. All in all, strategic management of implementations was not the main focus of this thesis. However, it seems that the factors related to it might subvert the more modest gains lying in successful trainings and other such things. Though trainings are important for a successful implementations, a successfully managed project might still succeed with less than satisfactory trainings. However, it does seem unlikely that a mismanaged project would be saved in the interactions between software provider and end users. It should be noted that this management of the projects does not rest solely on the software provider, but requires quite many changes from the clinic as well.

5.4 Theoretical implications

This study examined technology acceptance among Finnish public health nurses working in cancer care. Being a case study, it further expands on the real-life knowledge available on this subject. Moreover, the relatively specific reference group also brings a novel angle to the research. As technology acceptance research — especially relating to UTAUT (Williams et al. 2015) — is often quantitative, a qualitative approach brings about different insights.

Six important enablers were identified in the study:

- Early involvement of (superuser) nurses
- Superior support and usage
- Integrations with existing systems
- Reducing the effect of changes in nurse-patient relationship
- Better workload management

All of these except better workload management were generally supported by the literature, making this study act as further proof. Regarding the better workload management, this study suggests that while reducing the workload itself is better, just being able to organize that workload might help, a finding that did not come up in the literature. In addition, nurses having to selectively invite patients was a relatively uncommon pattern in the literature. As such, its appearance in this study widens the view of how digital technologies can change the nature of the nurse-patient relationship.

Five important hindrances were identified in the study:

- Incompatibility with workflow
- Difficulties in motivating patients to use the service
- Increased workload
- Lack of use by colleagues and superiors
- Uncertain, forceful implementation process

All of these were supported by the literature to some extent. However, somewhat in contrast to the literature, this study suggests that the lack of use (not only negative attitudes) of colleagues and superiors might be important factors in technology acceptance. Also, the roles of privacy and confidentiality were not as prominent in this study as they are in the literature. Besides, this study offered a specific example of an incompatibility between daily workflows and the technology: the cyclic work nature of the researched clinics affected their software usage quite strongly. This highlights that the compatibility with workflow does not only refer to how individuals work, but how the sociotechnical system itself is organized.

The literature review of the study looked into health IT acceptance factors from the lens of UTAUT. Because UTAUT studies often relate to technology acceptance in general and HIT acceptance studies do not relate to UTAUT, this can be considered as a new approach to the topic. Furthermore, the review gathers the findings from multiple HIT review articles into one. The found factors generally aligned well with the UTAUT categories. However, the role of more high-level, organizational issues came up as an important factor that was not necessarily covered by the model.

The importance of high-level organizational factors also got brought up in the empirical results in a way that was aligned with the findings from the literature. As such, it further highlights the importance of managerial decisions in the implementation process. On the other hand, the thesis suggests approaches for making these managerial decisions in an end user -driven manner.

The study also sheds light on the software provider's role in HIT implementations. The findings in Section 5.3 reflect on the software provider -related aspects that came up in the study. On one hand this thesis gives some insights regarding user-level changes such as providing workload-reducing software tools and doing trainings in a hands-on way. The latter especially answers to the scarcity of previous research about intervention-level changes (Lyon and Bruns 2019). It also seems like the use of modeling training techniques had not been very widely researched in a healthcare context. However, some studies exist (e.g. Naseer et al. 2008; Bjerrum et al. 2013). This study can be seen as adding to their view of modeling techniques

as a promising approach to HIT training. On the other hand high-level practices are suggested: involving nurses early, communicating with them constantly and suggesting best practices for clinics as part of the implementation process. Research regarding HIT implementations is often done from the viewpoint of how the clinic can help, with the software provider's role getting less attention. This study, then, can be seen as providing an unusual angle on the subject.

5.5 Practical implications

In this section, some practical measures will be presented for health IT providers to make their technology better accepted in the clinical context. However, while these are aimed at the software providers, many of these could be more effective if taken to heart by the management at the clinic itself, since they ultimately have the authority at the clinic. Whatever is done, however, should be done in a way that is driven by the needs and hopes of the end users. Ignoring those will quickly undermine the whole implementation, because whatever benefits could be caused by the system will be moot if it is not actually used.

Ask for clinic to select superuser nurses, involve them in the implementation and keep them informed about upgrades. It is not feasible or necessary for all nurses to be part of the implementation process. However, having some nurses be a part of the implementation process right from the start is useful. They can help in implementing the system in a way that fits their workflow. Besides, involving them sends the message that they are valued. These superusers should also be kept informed about changes since they inform other nurses. If possible, these nurses should not be selected by who happens to be available but proactively invited by clinic management to be a part of the implementation.

Do trainings in a hands-on, collaborative way in which the patient view of the software is also shown. Hands-on training helps nurses to get comfortable with system use. Model the tasks first, after which nurses should do them themselves. Having nurses re-enact the patient-nurse interaction in a training situation reflects

the real-life use of the software and makes them collaborate with each other. Understanding the patient side of the system can also give confidence in guiding the patients with the system.

Integrate the software to existing systems. Especially in contexts where the same information needs to be documented into the existing electronic health record systems, having the new system integrate with them can reduce the workload of the nurses. While this means a monetary investment in product development work, the trade-off might be worth it.

Facilitate peer learning (compensated time, manual in software, training done in groups). The software provider cannot train all new nurses in using the software. Nurses should be able to teach the system to others as effortlessly as possible. This could be facilitated with things such as clinic-compensated time for peer learning, having a manual for the software (digital or otherwise), and doing software provider -led trainings in a way where nurses help each other.

Have a quick and professional technical support. Technical problems will inevitably arise in software use. Therefore, a technical support that answers quickly and professionally can be very beneficial. Besides, nurses should be encouraged to ask about problems from technical support to avoid the situation where problems arise but are never solved because the software provider does not know of them.

Suggest best practices to clinics in implementation (or even sales) phase. The prospective clinics should be informed of prior experiences regarding software usage. Doctors not using the service can increase workload, nurses having to select who to invite to the service can be uncomfortable, everyone should know how to use the service to make substitutions easier. These should not be rigidly implemented in a top-down manner, but leveraging software provider expertise as early as possible might be a good starting point to a nurse-oriented implementation process.

Develop features that reduce workload and metrics to prove that. Managing workload is good, but reducing it is probably better. The features of the software should support reducing the workload of the nurses. In the case of the

Kaiku Health -service, that could mean being able to see the patients of the next day in an easy way, or having all important information about a patient visible at once. In addition, metrics should be available for these benefits. They can be ones that are visible in the software statistics, or ones that are implemented internally at the clinic (system tracking calls made). Besides, the change in metrics should be tracked by the management. Nurses should not need to justify their system usage to clinic management, because it can lead to a situation where instead of seeking better justifications they just stop using the system.

5.6 Limitations and evaluation

In this section, the limitations of the study will first be looked at. Afterwards, the study will be evaluated according to the criteria specified by Whittemore et al. (2001).

5.6.1 Limitations

The first important limitation regarding the study is the amount of interviewed nurses. 3 nurses were interviewed, while all other views were gathered through feedback questionnaires and discussions in the trainings. Interviewing nurses between the action phases might have given more and deeper insights into the training design. However, the combined findings of the coordinator interviews, the nurse interviews as well as the two trainings and their questionnaires formed a relatively fruitful dataset, still.

The second limitation pertains to the case study nature of the research. The number of cases was relatively low. Moreover, the cases are situated in the very specific context of Finnish public sector oncology. What follows is that the results of the study are not very generalizable or conclusive, even though they seem to be in line with existing literature. On the other hand, the narrow focus was also a conscious decision: it reduces the role of context-related variations and makes the

research less resource-intensive.

The third limitation relates to the changing nature of the research. While action research by nature requires transforming the research along the way, unnecessary changes could have been avoided by more rigid planning before the actual action phase. However, these changes were relatively small and as such should not have affected the outcomes of the study too much. In general, the study cannot give generalized facts about technology acceptance, nor does it try to. It should be taken as a narrow deep dive into the complex sociotechnical process of health IT acceptance.

Another limitation could have been a conflict of interest between the software provider's goals and the objectivity of the thesis. However, despite being employed by the software provider the researcher was allowed to work fully independently on the thesis and as such no conflicts did arise.

5.6.2 Evaluation of the study

Whittemore et al. (2001) have defined four primary criteria (credibility, authenticity, criticality and integrity) and six secondary criteria (explicitness, vividness, creativity, thoroughness, congruence, sensitivity) for assessing the validity of qualitative research. The definitions of these criteria will now be given and the research assessed according to them. It should be noted that while the concepts are in their own paragraphs for clarity's sake, the definitions are from the article by Whittemore et al. Primary criteria are bolded and italicized, while secondary criteria are only italicized.

Credibility refers to whether the experiences of the participants or the context are reflected "in a believable way". Regarding this, the experiences of the participants have been asked directly from them. Every participant has also had the opportunity to offer opinions with only the researcher hearing them, reducing the effect of social influence.

Authenticity refers to awareness of the subtle differences in the voices of all participants. When doing the interviews and trainings, the researcher has asked for clarification in cases where something has been unclear. In addition, direct quotes have been utilized in the results and, while translated, should describe the participant experience relatively accurately.

Criticality refers to whether the research process "demonstrates evidence of critical appraisal". The literature review of the study contrasts different viewpoints with each other and often presents alternatives. The results of this study have been contrasted with the relevant literature in a critical manner. Moreover, the limitations of the study have been discussed in Section 5.6.1.

Integrity refers to whether the research has "recursive and repetitive checks of validity [and] a humble presentation of findings". Action research by default involves critical appraisal of the process when it is ongoing. Besides, every interview and training structure has been looked through with at least one person (instructor or supervisor) to ensure their integrity.

Explicitness is about whether "methodological decisions, interpretations, and investigator biases have been addressed". The study is meticulous about referring to source literature to separate researcher views and the views of the relevant literature. The limitations of the study are outlined in a separate section and methodological decisions are described in detail throughout the study.

Vividness — "have thick and faithful descriptions been portrayed with artfulness and clarity?" The style of writing tries to be as clear as possible, and direct quotes are used for added clarity.

Creativity refers to the "imaginative" organization and presentation of data in the thesis. Figures, tables and lists have been used throughout the thesis whenever possible to make data more easily comprehensible.

Thoroughness is about whether the findings completely "address the questions posed". The questions have been answered in a detailed way in Chapter 4 and in a more compressed manner in Chapter 5. As much as possible, the thesis is also

structured *vis-à-vis* the research questions. One exception to this is Section 4.5, where enablers and hindrances were grouped together based on their category for readability.

Congruence is concerned with the process and findings being in line with each other. As displayed in Chapter 5, the findings have been relatively in line with prior literature. Moreover, the process has been planned based on existing practices regarding action research, interviews and end-user trainings.

Sensitivity is about whether the research is sensitive in its treatment of the "nature of human, cultural, and social contexts". Participants have been asked permission to use their answers in the thesis. Furthermore, their names and their employers' names have been anonymized to avoid identification. Meetings have been scheduled based on their timetables and if travel has been required, the researcher has traveled to meet the participant in their location.

5.7 Conclusions and future research

The aim of the study was to find out the enablers (RQ1) and hindrances (RQ2) of nurses' behavioral intention towards a digital service in cancer care as well as how the software provider could support the acceptance of a digital service in cancer care (RQ3). The study was done as an action research case study, consisting of 3 coordinator interviews, 3 nurse interviews and 2 end-user trainings.

To answer RQ1, six larger themes were identified as enablers: early involvement of (superuser) nurses, superior support and usage, integrations with existing systems, hands-on testing with peers, reducing effect of changes in nurse-patient relationship, and better workload management.

Concerning RQ2, four larger hindrances were found: incompatibility with workflow; difficulties in motivating patients to use the service; increased workload; lack of use by colleagues and superiors; and uncertain, forceful implementation process.

Pertaining to the software provider's role and RQ3, four larger findings were identified: HCP-oriented hands-on trainings might help, but clinic workflow can reduce their usefulness; involving nurses early and keeping them up-to-date might make them more accepting of the new software; providing nurses with tools to manage and decrease their workload might help their daily work; suggesting guidelines based on nurse experiences to the clinic management could make service use more effortless.

Because of its nature as a case study, this study is not extensive by any means. Nevertheless, it gives some insights on the acceptance of healthcare information technology in Finnish public sector oncology. In addition, it elaborates on the role of the software provider in technology acceptance. While the study does not dismiss the importance of technical factors, it reinforces the view of social and organizational factors being an essential concern in technology acceptance. Health IT implementations should not be viewed as transactional processes where the software is passed from software provider to clinic management and further to end-users. Unless the software is purely a digital reconstruction of an analog workflow, its introduction requires reconsidering stakeholder dynamics and collaboration processes. This is undeniably difficult, and as such the prominence of failing implementations is not surprising. While this research offers one viewpoint on how to improve implementations, further research is needed. Based on the findings of this study, six different directions are proposed, with a focus on the aforementioned social and organizational factors:

(1) The involvement of nurses in the implementation process should be further looked into. At what point should the nurses be involved? Is the selection of the provider too early in the process? Moreover, what are the reasons that nurses would not be involved in the start? Researching the views of the clinical management and their relation to nurse opinions could provide insight into this. On the other hand, the best practices for gathering feedback from end users and actually implementing that into the software development process might be a worthwhile angle, especially from the software provider perspective.

(2) The power relations between the clinic and the software provider could also be

examined. The software provider is not ultimately in control of the clinic's decisions, but are they allowed to disagree with the views of the clinical management? If not, why? And if yes, what potential gains and pitfalls could there be in trying to take a more proactive role in the implementation process? As mentioned by Boonstra and Govers (2009), studies on the impact of a technology implementation on the power of stakeholders are scarce. For example, observing the sales and implementation process and its meetings could give insight into the power dynamics between different stakeholder groups.

(3) What are the actual changes in the workflow that are caused by the new digital service? A longitudinal, potentially ethnographic study could be a way to approach this question. Changes in for example social structures and task management could be analyzed.

(4) How can peer learning be facilitated? If the software provider is not able to provide training to every new employee, who will? Will this be done in a formalized way or alongside work? Looking into how and if new employees are on-boarded in general could offer some answers to this question. Then again, could a manual inside the software itself help with this?

(5) When is the best time to train nurses and how should it be done? In this study, some of the training was felt to be given too late and the modeling approach was found relatively good. Then again, organizational factors determined nurses' service use, and as such the findings regarding trainings are only indicative. More research should be done to find out when trainings should optimally be given and to validate behavior modeling in a healthcare context.

(6) What factors affect doctor usage of interdependent clinical digital solutions? In this study, lack of superior usage caused problems in nurses' daily work. Are doctors unaware of these problems? If not, why do they not use these digital services? Potential reasons are many: social standing being affected, software features not fitting their workflow, the benefits of the software not being major enough compared to what else they could be doing, etc. A qualitative study about doctor perceptions could help in understanding the factors affecting doctors' software usage.

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Appendix A

Interview structure

A.1 Coordinator interview structure

All coordinator interviews were held in Finnish, but have been translated into English. Being thematic interviews, these questions only guided the interviews. As such, not all of them were asked. Besides, other questions were also asked based on the interviewee's answers. "Kaiku" here refers to the Kaiku Health -service. The term was used because it is the name coordinators use to talk about the service.

Introduction

1. Can the interview be recorded?
2. The interviews will be used in the thesis anonymously, and interviewees will be referred only by their current position.
3. This interview aims to find how you perceive the use of Kaiku among medical nurses in public sector oncology. It also aims to find out the ways nurses have been taught the use behaviors and contexts of Kaiku. I will refer to medical nurses in public sector oncology as medical nurses in this interview.

Background of the interviewee

1. What is your current role in the organization?
2. Tell a bit about your background.

   How long have you been in the organization?

   In which roles?

Nurses' feelings about the service

1. What medical nurses' feelings regarding Kaiku in general?

   Is there a clear division?

2. What things do medical nurses regard as negative in using Kaiku?
3. What things do medical nurses regard as positive in using Kaiku?

Service usage at the clinic

1. How does your the work of medical nurses differ from what it was before Kaiku was taken into use?

   Can you give some examples?

2. In an optimal scenario, how would medical nurses use Kaiku in their daily work?

Service implementation at the clinic

1. How do you help medical nurses in taking Kaiku into use?

   What kind of problems have there been?

   What kind of successes have there been?

2. What should be done to help the medical nurses, but have not been done?

   Why have these not been done?

Additional thoughts and comments

1. Is there something you would like to add that was not discussed in this interview?
2. How was the interview in your opinion? How could it be improved?

A.2 Nurse interview structure

All nurse interviews were held in Finnish, but have been translated into English. Being thematic interviews, these questions only guided the interviews. As such, not all of them were asked. Besides, other questions were also asked based on the interviewee's answers. "Kaiku" here refers to the Kaiku Health -service. The term was used because it is the name nurses use to talk about the service. **Introduction**

1. Can the interview be recorded?
2. The interviews will be used in the thesis anonymously, and interviewees will be referred only by their current position.
3. This interview aims to find out how you perceive the implementation of the Kaiku-service and its usage in your daily work. Perceptions of the service will be looked into, as well as views and experiences of how service usage is going, how the implementation process was in your opinion and how the situation could be made better than it currently is.

Background of the interviewee

1. What is your current role in the organization?
2. Tell a bit about your background.

   How long have you been in the organization?

   In which roles?

   What have you done before this?

   How often do you use Kaiku in your work?

Nurses' feelings about the service

1. What are your feelings regarding Kaiku in general?

   Have your feelings changed over time? How?
2. How do your colleagues feel about Kaiku in general?

   Is there a clear division?

Service usage at the clinic

1. What things do you regard as negative in using Kaiku?
2. Do these reflect the fears you had before starting usage?
3. What things do you regard as positive in using Kaiku?
4. How does your current work differ from what it was before Kaiku was taken into use?
5. In an optimal scenario, how would you use Kaiku in your daily work?

Service implementation at the clinic

1. Whose idea was it to take Kaiku into use at your clinic?
2. At what point did you hear that Kaiku is taken into use at the clinic?

   How did that happen?

   Who told you and how?

   When?
3. What kind of support have you got for taking Kaiku into use?

   From clinic management?

   From Kaiku [Health Ltd.]?

   From your colleagues?
4. What kind of support would you want for using Kaiku, but have not received?

   Why have you not received such support?

Additional thoughts and comments

1. Is there something you would like to add that was not discussed in this interview?
2. How was the interview in your opinion? How could it be improved?

Appendix B

Training 1: Documents

B.1 Consent document

Study: Master's thesis on digital services in nursing work; Aalto University (Information Networks)
Researcher: Aleksi Taipale
Date: dd.mm.yyyy

Consent document

Contact person

Aleksi Taipale, [email], [phone number]

Purpose of the study

The purpose of the study is to ease the implementation of digital software in nursing work. The study is done using the Kaiku Health -software, as a master's thesis into the study program of Information Networks in Aalto University.

Data collected in the study

dd.mm.yyyy	dd.mm.yyyy - dd.mm.yyyy	dd.mm.yyyy
Starting survey & training	Regular Kaiku usage as part of daily work (gathering usage statistics)	Ending survey (via email)

The survey answers will be treated anonymously in the study. In the study, however, nurses can be referred using letters and numbers in the style of "Clinic A, nurse 1", however, in such a way that the information cannot be connected to the identity of the nurse. The training done on dd.mm.yyyy will be treated in a general manner, and nurses will not be referred to individually, even with the aforementioned numbers, to avoid identification.

In addition to this, in the study the survey answers will be compared to usage statistics of each nurse from the following two weeks. The statistics analyzed are: amount of messages, number of logins, time spent in the service and the amount of sent, assigned and unassigned tasks.

The researcher *does not* have permission to collect or use any other data than the ones that have been mentioned above.

The research subject can at any time forfeit their participation to the study, at which point all data related to that person will be deleted promptly.

☐ I allow the usage of my information for this study, in the manner described above

☐ I do not allow the usage of my information for this study

_____
Email (for the follow-up survey)

_____ _____
Place and date Name and signature

B.2 Computer self-efficacy survey

Study: Master's thesis on digital services in nursing work; Aalto University (Information Networks)
Researcher: Aleksi Taipale
Date: dd.mm.yyyy

Starting survey

Imagine that you are at work and have been given a new (any) computer software to use that you have not used before. The program's exact functionality does not matter here. You are asked to do a task with the software, one you have not done before.

Listed below are several situations related to doing the task. Circle the value you feel best describes, how well you could perform the task with the new software in that situation.

		I could complete the job using the computer software....										
		Not at all	...not at all confident				...moderately confident					...totally confident
		⬇	⬇				⬇					⬇
1.	…if there was no one around to tell me what to do as I go.	0	1	2	3	4	5	6	7	8	9	10
2.	…if I had never used a software like it before.	0	1	2	3	4	5	6	7	8	9	10
3.	…if I had only the software manuals for reference.	0	1	2	3	4	5	6	7	8	9	10
4.	…if I had seen someone else using it before trying it myself.	0	1	2	3	4	5	6	7	8	9	10
5.	…if I could call someone for help if I got stuck.	0	1	2	3	4	5	6	7	8	9	10
6.	…if someone else had helped me get started.	0	1	2	3	4	5	6	7	8	9	10
7.	…if I had a lot of time to complete the job for which the software was provided.	0	1	2	3	4	5	6	7	8	9	10
8.	…if I had just the built-in help facility for assistance.	0	1	2	3	4	5	6	7	8	9	10
9.	…if someone showed me how to do it first.	0	1	2	3	4	5	6	7	8	9	10
10.	…if I had used similar software before this one to do the same job.	0	1	2	3	4	5	6	7	8	9	10

B.3 Follow-up survey

The follow-up survey for training 1 was done using the SurveyMonkey platform. Its contents were as follows:

1. General thoughts regarding the workshop

   In this field, I would like to get general comments regarding the workshop. What went well? What could be improved? What were your general feelings? With these answers, I can develop the workshop further and know better what worked and what did not.

2. The CSE questionnaire, as depicted in Appendix B.2
3. Can the data collection period be extended from [the previous period] to [a period 1 month longer]
4. Contact information

Appendix C

Training 2: Documents

C.1 Survey 1

Study: Master's thesis on digital services in nursing work; Aalto University (Information Networks)
Researcher: Aleksi Taipale
Date: dd.mm.yyyy

Survey in beginning of training

Name is needed to connect the answers of the three separate surveys. In the thesis itself, people will be referred to in a manner that prevents identification.

Background information

Name	
Age	
Gender	

How long have you worked at [clinic], and what is your role currently?

How would you describe your proficiency with IT, in a couple of sentences?

Earlier usage of Kaiku

How often have you used Kaiku in the last month?

What have you used Kaiku for during the last month?

How has usage of Kaiku been?

Behavioral intention

	Strongly disagree						Strongly agree
I intend to use the Kaiku system in the next 2 months (circle answer)	1	2	3	4	5	6	7

Why / why not?

I predict I would use the Kaiku system in the next 2 months (circle answer)	1	2	3	4	5	6	7

Why / why not?

I plan to use the Kaiku system in the next 2 months (circle answer)	1	2	3	4	5	6	7

Why / why not?

C.2 Survey 2

Survey 2 was done at the end of the training. It was almost the same as the first one (Appendix C.1). However, two changes were made:

1. After each numerical BI question, the question was not "Why / why not?" but "Did this change compared to the first survey? Why / why not?"
2. An additional question was added: "How did you feel about the training in general? What worked? What could be improved?"

C.3 Survey 3

Survey 3 was done two weeks after the training. The contents were slightly changed from the prior 2 surveys. Altogether, survey 3 was structured as follows:

1. Name
2. How often have you used the Kaiku-service in the last 2 weeks? (1 login = 1 time)
3. What have you used the Kaiku-service for during the last 2 weeks?
4. How has usage of the Kaiku-service been?
5. The behavioral intention questions in the way they were done in survey 2 (Appendix C.2)
6. What would make your Kaiku usage easier?
7. Other thoughts of wishes related to the Kaiku service?

Appendix D

Interviews: codes and quotations

Table D.1: Codes and the relevant quotations from the 3 coordinator interviews

Code	**Amount of quotations**	**Amount of interviewees who mentioned this**
Age of patients	2	2
Amount of calls	2	2
Amount of existing systems	6	2
Amount of patients	2	1
Available time	17	2
Current implementation	9	1
Doctor usage	5	2
Doctors affecting implementation	8	2
Face-to-face contact	5	3
Feedback from patient	1	1
Feelings about Kaiku	3	2
Feelings change over time	8	2
Finding relevant information	1	1
Internal processes unclear	5	3
Nurses affecting implementation	27	3
Nurses do not reflect on their work outside work	1	1
Patient nurse relationship	9	2
Peer support	2	1
Seeing patient development over time	2	2
Standardized implementation measures	3	1
Superusers	5	3
Support of superiors	4	2
Time management	4	1
Training new employees	1	1
Workload	3	2

Table D.2: Codes and quotation amounts from the 3 nurse interviews

Code	**Amount of quotations**	**Amount of interviewees who mentioned this**
Affecting implementation	4	1
Amount of existing services	1	1
Amount of patients	4	2
Amount of phone calls	3	2
Colleagues' feelings	5	2
Colleagues' knowledge of Kaiku	3	2
Decisionmakers of implementation	1	1
Difference to paper forms	3	3
Discomfort with digital systems	2	2
Doctor usage	10	3
Doctors using Kaiku	2	2
Easiness to learn	2	1
Feelings over time	3	3
Finding out unexpected urgencies	2	2
Flow of information	9	3
Good feedback from patients	1	1
Having superusers	5	1
Implementation decisionmakers	5	3
Inbound contacting	2	1
Integrations	3	2
Knowing about implementation process	5	2
Lack of time	4	2
Lack of use experiences	1	1
Logging in	1	1
Medical nurses	1	1

Appendix E

Trainings: codes and quotations

Table E.1: Codes and note amounts from training 1

Code	**Amount of notes**
Communication with the patient	3
Content of the training	13
Resources for using the service	4
Selling the service to the patient	7
Service features	4
Service in daily use	3
Social context	2

Table E.2: Codes and note amounts from training 2

Code	**Amount of notes**
Content of the training	18
Nurse background	13
Selling the service to the patient	4
Service features	13
Service in daily use	21
Social context	26
Software provider actions	7